AN ARGUS SPECIALIST PUBLICATION
SEPTEMBER 1986
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Your COMMODORE

YOUR BEST INDEPENDENT COMMODORE MAGAZINE

COMMODORE'S 128

JUST WHAT IS AVAILABLE?



COMMODORE CLINIC

FIRST AID FOR YOUR TECHNICAL PROBLEMS

COMPETITION Win a set of 128 software from Timeworks

SEPTEMBER 1986
VOLUME 2
NUMBER 12

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C128 SPECIAL

DATA STATEMENTS

Lucky Dip

At last someone has got the official rights to make the computer game of *Trivial Pursuit*. There have been several look alikes but this one from Domark is the real McCoy.

Apparently, not only is it the authorised version but it also features a great technical innovation called uniload. This is a unique system allowing a universal question tape to be loaded into either the Spectrum, C64 or Amstrad.

The game will be launched at the PCW show in September and will set you back a mere £14.95 – cheaper than the board game!

Martech has a new release due in August. *W.A.R.* is the story of a mechanical race whose sole purpose is to seek out and conquer. The latest victim of this lust for power is, of course, the Earth. The task is to save the world – which seems to be getting into a lot of scrapes lately. Now you can play at W.A.R. but look out for the unmerciless Droidians.

A'n'F has recently launched a 'true arcade adventure' entitled *Core*. The action takes place in real time with full graphical display, plenty of puzzles and over 1000 locations.

The object of the game is to guide Asteroid Andy around a labyrinth of tunnels to find nine parts of a biological memory bank which will reveal to you the cause of the sudden and tragic death of all the scientists on the asteroid. A bit unproductive but probably better than saving the world again.

The game is for the C64 and costs £8.95.

The wild west once again reaches your computer screen, this time in the form of a new release from US Gold.

The Law of the West, sees you enrolled as sherrif of Gold Gulch with the job of cleaning up the town. Gunslingers, desperadoes and outlaws combine their evil forces to bring violence to this pioneer town. Clean it up or you lose your badge. However, although you can shoot to kill when it comes to the gunslingers etc. mind you don't go round gunning down innocent people as this won't do your ratings any good.

The Law of the West is available now priced £9.95 on cassette and £14.94 on disk.



The official Trivial Pursuit

Adventure Line

There is now a new adventure from the All American Adventures fold entitled *Questprobe* featuring none other than the Human Torch and the Thing. Remember those characters from the famous Marvel comics?

It was written by Scott Adams, well known for his prowess as an adventure programmer, and it is the third in the *Questprobe* series.

The C64 version costs £9.95 on cassette and £14.95 on disk.

Also on the adventure scene, but this time in the post nuclear age, after the holocaust, Mind Games springs into action with *Time Trax*. This game involves the forces of good versus the Dark Ones in a battle to the death in various different ages of man and before.

Your performance is rated at the end of each game and you can progress from Pudding to Demigod – a rather amazing transformation by anybody's standards.

The Lord of the Rings Trilogy

It should be in the shops now and the C64 version is priced at £9.95.

If you're a fan of Tolkien's novels then you can now have a full set on computer. *The Lord of the Rings* has arrived for the C64 to join the *Hobbit*. It is of course from Melbourne House and in a bumper pack as the amount of material demands.

THE ULTIMATE UTILITY FOR YOUR COMPUTER

SPEECH!



NO EXTRA HARDWARE REQUIRED

AS REVIEWED ON BBC TV

FOR THE COMMODORE AMSTRAD AND BBC COMPUTERS

COMMODORE 64/128
Cassette **£9.95**
Disc **£11.95**

AMSTRAD CPC464/664/6128
Cassette **£9.95**
Disc **£14.95**

BBC MICROS: B, B+, Master
Cassette **£9.95**
Disc **£11.95**

At last, speech synthesis at a price you can afford. SPEECH! works entirely in software taking up less than 9K of RAM: no extra hardware whatsoever is required. Unlike other systems, SPEECH! has an unlimited vocabulary: it will say anything you want it to, and is simplicity itself to use. Simply type in: ***SAY I AM A TALKING COMPUTER, AS EASY TO USE AS 1 2 3...** and the computer speaks.

SPEECH! has a built-in parser which translates English words into "phonemes", or speech particles. There are 49 phonemes and 8 different pitch settings which can be used directly by the *SPEAK command (e.g. *SPEAK/HEH4LOW4) so stress or intonation can easily be added wherever desired. You can change the overall pitch with the *PITCH command.

Every copy of SPEECH! comes complete with extra software:

DEMO — shows off all the features,
SPELL — an innovative educational program,
SAYFILE — speaks the lines of your programs.

Applications in:
- games
- education
- business
- utilities

THE RECENTLY RELEASED BBC MICRO VERSION HAS BEEN GREETED WITH ACCLAIM AND INCREDULITY:—

REVIEWS ON BBC-1 AND BBC-2 TV

Saturday Superstore (BBC-1)
"This is knockout! This is great! ... Wonderful! Very, very clever." ... Fred Harris

Micro Live (BBC-2)
"Really good value!" ... John Coll

REVIEWS IN THE COMPUTER PRESS

"The reproduction is suprisingly good, and certainly on a par with some of the more expensive speech interfaces I have heard. An excellent low cost speech synthesiser that really is very good value for money." ... ACORN USER

"... incredibly easy to use. The end result is as good as anything I've heard this side of the Amiga." ... POPULAR COMPUTING WEEKLY

"Overall an excellent package" ... MICRONET 800.

"This is one utility which cannot be beaten on quality or price" ... The MICRO USER.

"SPEECH! from Superior Software is a truly remarkable offering. A rare gem indeed. Superior Software has produced a price breakthrough by achieving an apparent technical impossibility." ... A & B COMPUTING.

OUR GUARANTEE
- All mail orders are despatched within 24 hours by first-class post.
- Postage and packing is free.
- Faulty cassettes and discs will be replaced immediately.

Access VISA

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SUPERIOR SOFTWARE Limited

Dept. YC1, Regent House, Skinner Lane, Leeds LS7 1AX. Telephone: 0532 459453

WE PAY TOP ROYALTIES FOR HIGH QUALITY SOFTWARE

SPEECH!

was greeted with admiration and acclaim by the computer press

(for the BBC Micro)

"Overall an excellent package.

Value for Money	5
Presentation	5
Use of Machine	5
Ease of Use	4
Facilities	5
Effectiveness	4

Total Score out of 30: 28"
MICRONET 800, December 1985

"Superior Software's SPEECH! is a quite remarkable piece of programming. .... The program takes up 7½ K of program space and is incredibly easy to use. It merely requires a new command word which is SAY preceded by a *. ... The end result is as good as anything I've heard this side of the Amiga and it'll make a stab at even the most ludicrous words constructed without vowels and at great length. ... It is possible to add words to the computer dictionary where they are not said exactly as they would be, using phoneme analysis and also to vary the pitch of the spoken voice. ... Why pay more?"
Popular Computing Weekly, 19-25 December 1985.

"The reproduction is suprisingly good and certainly on a par with some of the more expensive speech interfaces I have heard. All in all, an excellent low cost speech system that really is very good value for money."
Bruce Smith, Acorn User, February 1986.

"SPEECH! from Superior Software is a truly remarkable offering. A rare gem indeed among the morass of mediocre to competent efforts which dominate a reviewer's postbag. In my view SPEECH! is an absolute breakthrough for the BBC micro which deserves to sell by the thousand. ... Superior Software has produced a price breakthrough by achieving an apparent technical impossibility. David Hoskins, the programmer, has cleverly programmed the sound chip to do things which its designers never intended it to do. ... A most practical application example also provided is a spelling checker. This has always been a problem case for educational software — how to test spellings without printing the word and revealing all. ... This program is well designed and effective and users are encouraged to customise it with their own examples. In short, SPEECH! is a very clever and useful program being offered at a silly price. If you were planning to buy another arcade game, take my advice and spend the money on SPEECH! instead."
Jonathan Evans, A & B Computing, March 1986.

"SPEECH! is the most talked-about package ever created for the BBC Micro. For the first time it endows your micro with the power of speech for an incredibly low price."
Christopher Payne, The Micro User, April 1986.

"If I were a manufacturer of a speech synthesis product I would be greatly worried by the arrival of SPEECH! This is one utility that cannot be beaten on quality or price.

SOUND	9
GRAPHICS	n/a
EASE OF USE	9
VALUE FOR MONEY	9
OVERALL	9

James Riddell, The Micro User, June 1986"



COMPETITION COMPETITION COMPETITION COMPETITION

THE QUIZ

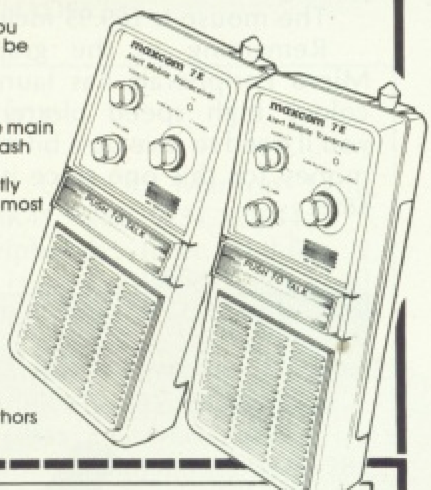
1. In which year did Superior Software release their first software cassette?
2. Can a computer be manufactured without using integrated circuits or transistors?
3. Which U.K. company manufactured the coin-operated arcade machine of the successful game Hunchback?
4. Name the author of Superior Software's SPEECH! program?
5. What was the name of the acclaimed home computer sold by Commodore before they produced the Commodore-64?
6. Which Superior Software game won the "Computer Gamer" Game of the Year Award for the Best BBC Game of 1985?
7. Name the Managing Director of Amstrad Consumer Electronics PLC?
8. Which of the following is not a valid phoneme representation as used in Superior Software's SPEECH!
EE UH C M NX ZH
9. What does the acronym ASCII stand for?
10. How do you spell the word "azure" phonetically in order to be pronounced correctly by the *SPEAK command of Superior Software's SPEECH! program?

Describe the most useful application of SPEECH! that you can envisage. (Please write your description on a separate sheet using more than 50 words, but not more than 200 words).

HOW TO ENTER
To enter, simply complete the 10-question quiz (on the left), and describe what you think is the most useful application for SPEECH! The completed entry form should be sent to Superior Software at the address given below.

THE PRIZES
Each entrant who answers the 10 question quiz correctly will receive a colourful SPEECH! badge (pictured left). All correct entrants will then be considered for the main prize of a pair of professional walkie-talkies (valued at **£200)**, a trophy, and the cash prize of **£100.** The winner of this prize will be determined at the close of the competition on 31st January, 1987. The winner will be the person who has correctly completed the 10 question quiz and, in the opinion of the judges, describes the most useful application of Superior Software's SPEECH! program.

RULES
1. All entries must be accompanied by a completed entry form and a description (on a separate sheet) of what, in your opinion, is the most useful application of SPEECH!
2. All entries must clearly show the sender's name, address and age (if under 18), and should be addressed to: "SPEECH! Competition", Superior Software Ltd, Regent House, Skinner Lane, Leeds LS7 1AX.
3. The closing date for receiving entries to the competition is 31st January 1987.
4. The company's decision is final and no correspondence can be entered into.
5. The competition is not open to the employees of Superior Software Ltd, the authors of SPEECH! their agents or their families.



1		6	
2		7	
3		8	
4		9	
5		10	

Name ______________________ Age (if under 18) __________

Address ______________________

____

Telephone __________

Multi-Releases

Contrary to popular belief that the summer is a bad time to launch several new products, Ariolasoft is going for it in a big way at the moment.

Ariolasoft has recently imported a set of programs from Holland all of a very different nature.

Floyd the Droid is a robot who needs to be programmed to clean up London's filthy sewers. You'll have to wipe out bats, rats and crocodiles (in London?).

Map Britain is an educational program in which you climb aboard your helicopter and try and get yourself where you really want to go. Designed to polish up your geography, it's all very well, but who wants to go to Milton Keynes anyway?

Databsis, is as it sounds, a database for the C64 and is priced competitively at £9.95. Throw away those index card boxes!

All these programs are for the C64 and are being handled in the UK by Ariolasoft for the Dutch company Radarsoft.

Cheapies Galore

As well as releasing the holocaustic game *Time Trax*, Argus Press software has decided to go for the slightly gentler market with the release of *Rupert and the Ice Palace*. On the Bug Byte label the game involves all your furry friends from those halcyon pre-school days and is a budget price at £2.99.

Speaking of budget software, Robtek has decided to go five steps ahead of everyone else and is releasing 50 games on one tape for the C64. They are all brand new games so you don't have to worry that half of them are the ones you got fed up with in 1983 and the whole cassette costs a mere £9.95.

The Americana range from US Gold is expanding beyond belief. There are now seven titles for the C64 and two for the C-16. The C64 cassette titles are *Beer Belly Burt's Brew Biz, Nuclear Nick, Necromancer* and *The Hulk*. On disk for the C64 are all these, except *The Hulk*, plus *Ollies Follies, Breakdance and New York City*. The C-16 games are *Robo-knight and The Hulk*.

C-16 and Plus/4

Games seem to be coming through for these machines fairly thick and fast these days.

Tynesoft is releasing Alligata's *Who Dares Wins II* and *Jet Set Willy II* (originally from Software Projects) for the C-16. Launch of the two games is provisionally set for September.

From Bubble Bus there is *Trizons* for the C-16 and Melbourne House has now successfully converted the chart-topping *Way of the Exploding Fist* for this machine.

Not content with this, however, Melbourne House is also doing a C-16 greatest hits cassette. Featuring *Wizard and the Princess, Classic Adventure, Roller King and Dark Tower, it costs £7.95.*

Hard Lines

Kempston has now launched a mouse which is compatible with the C64 and Amstrad CPC6128D. Compatibility is achieved by a simple flick of a switch.

The Kempston mouse uses an optical system to decode movements of an internal tracker ball and is precisely monitored by the interface using a simple port read. According to Kempston, this feature means that the protocol can be easily incorporated into existing or future graphics or business packages.

The mouse is £69.95 including VAT.

Remaining in the graphics area, Micro Peripherals has launched a six colour high speed plotter. However you'll need to save up a bit more pocket money for this one since it'll cost you £899.

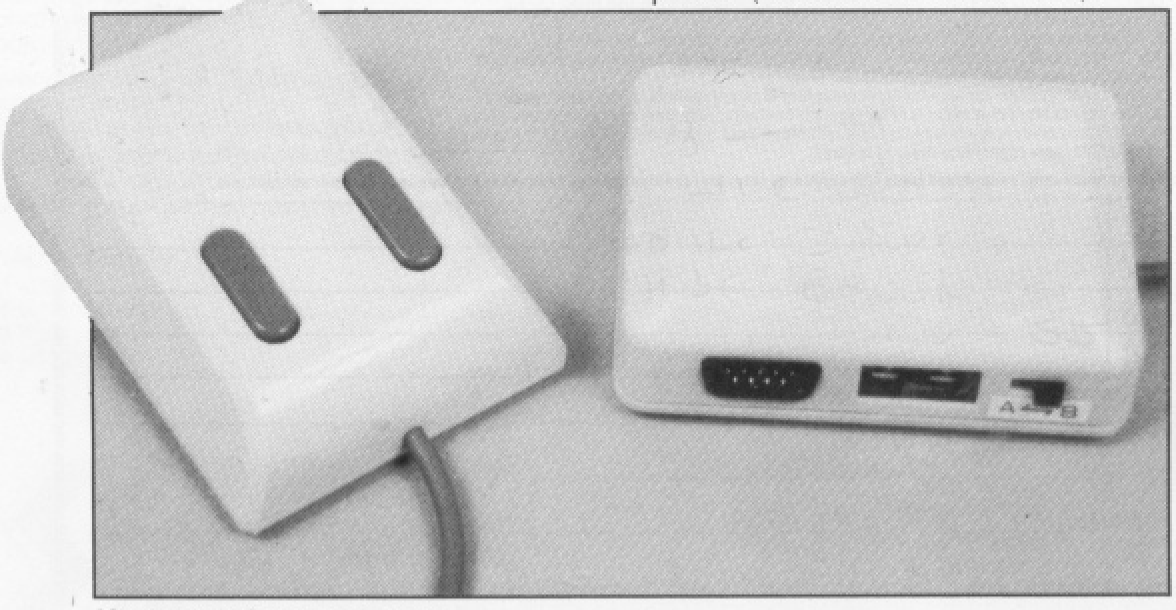
The printer/plotter is the Sekonic SPL - 430 and is a high resolution professional plotter with an accuracy of 0.025mm. There are 56 resident plotter commands.

Parallel and serial interfaces are standard and there is a choice of oil or water pens.

There's also a new printer from Citizen, Codenamed the LSP-10. It is described by Citizen as a dot matrix printer specifically for the European market. It is priced at £255 and is available now.

Star Micronics is aiming to increase its sales by being kind to the consumers' pockets.

Two Star printers have been reduced in price: the 18cps Powertype daisy-wheel printer (reduced from £349 to £229) and the 60cps stx-80 thermal printer (reduced from £149 - £79).



Kempston's new mouse

Touch Line

Martech: Bay Terrace, Pevensey Bay, East Sussex BN24 6EE. 0323 768456.
Argus Press Software: including Bug Byte, Mind Games and A'n'F: Liberty House, 222 Regent Street, London W1R 7DB. 01 439 0666.
US Gold/Americana/All American Adventures: Unit 10, The Parkway, Industrial Estate, Heneage Street, Birmingham B7 4LY. 021 359 4327.
Melbourne House: 60 High Street, Hampton Wick, Kingston Upon Thames, Surrey KT1 4DB. 01943 3911.
Robotek: Unit 4, Isleworth Business Complex, St Johns Road, Isleworth, Middx TW7 6NL. 01 847 4457.
Tynesoft: Addison Industrial Estate, Blaydon Upon Tyne, Tyne & Wear NE21 4TE. 091 414 4611.
Bubble Bus: 87 High Street, Tonbridge, Kent TN9 1RX. 0732 355 962.

Generally Speaking

Having decided that the software industry is peopled with untrendy beings who know nothing about modern dress habits, Bug Byte has introduced its own range of designer clothes to amend this ghastly oversight.

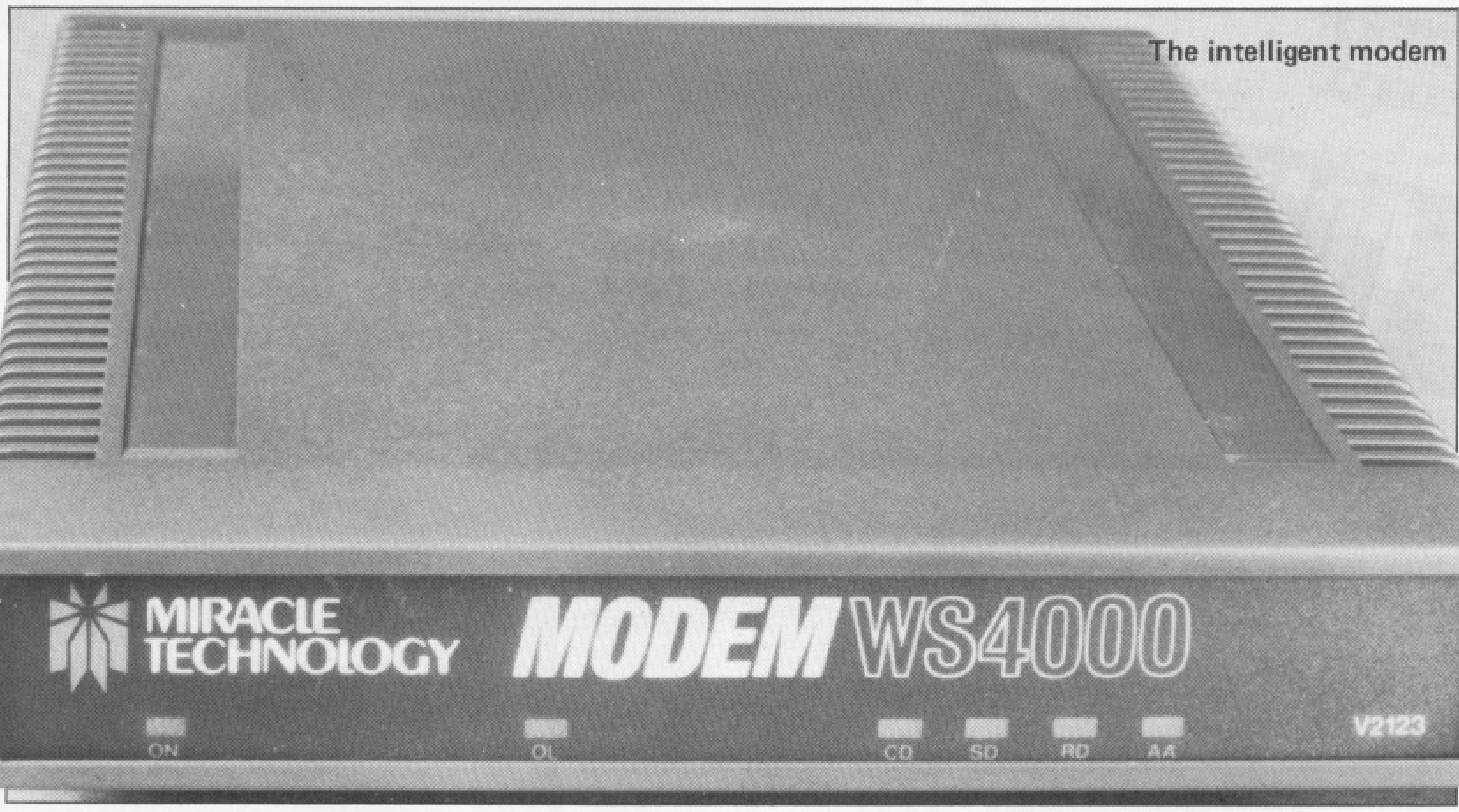
As yet the range only contains one tee-shirt but, we are reliably informed that underpants are on the way.

The clothes are designed by 12½ year old pre-teenage prodigy Mark Taylor, an ardent fan of Bug Byte games.

We haven't been informed as to whether Bug Byte designers will be featuring in any major fashion shows this season.

Still on the subject of fabric-wear for games players, Beyond is giving away a free tee-shirt to everyone who buys a copy of Bounces for the C64. One snag is that you have to buy another game as well to qualify for the offer which is available to mail order customers or those shopping at the PCW show.

Bounces costs £9.95 and the tee-shirt



The intelligent modem

In Touch

Ever heard of an intelligent modem? Apparently there's now one on the market from Miracle Technology. Called the WS4000 it's fully intelligent and speed buffered and offers autodial and autoanswer as well as Hayes type compatibility for £149.95.

In standard version the WS400 supports the CCITT V21 and V23 standards offering speeds of 300, 600, 1200, 1200/75 and 75/1200. Optional upgrades include V22 1200 baud full duplex and V22bis 2400 baud full duplex plus options of DTMF tone dialling, battery packed internal telephone directory, process control port and BELL standards for transatlantic communication.

It has been approved by British Telecom and is already available from Miracle Technology.

On a lighter note, Micronet members will soon be able to enjoy a multi user game. From the end of August this year, SHADES will be up on the net.

The cost of the game is 99p per hour and there is no registration fee. At off peak time access will be charged at local telephone rates.

Micronet has been searching for some time for a multi user game which would be both economical to run and could also cope with a large number of simultaneous users.

Micronet's technical Director, Mike Brown, designed the protocol to convert scrolling text into viewdata format using split screen windows.

Mike said: "The overall effect is extremely good. We've exploited the positive features of viewdata – including colour – to provide elegant, inexpensive access to SHADES".

is worth £5.95.

If you're looking for a way to kill some time between August 1-3, then you may like to have a look at the British Music Fair at Olympia 2 in London.

The fair has a special section devoted to computer music. There will be half hour demonstrations by professional musicians throughout the duration of the show to illustrate how hardware and software can be used. In between demonstrations visitors will have the opportunity to try out the equipment themselves.

For the educational market there will be programs demonstrated which introduce children to basic musical concepts and for musicians there will be packages for different types of sound sampling, recording and editing.

Many of the exhibitors at the show will also be demonstrating new computer music systems on their own stands.



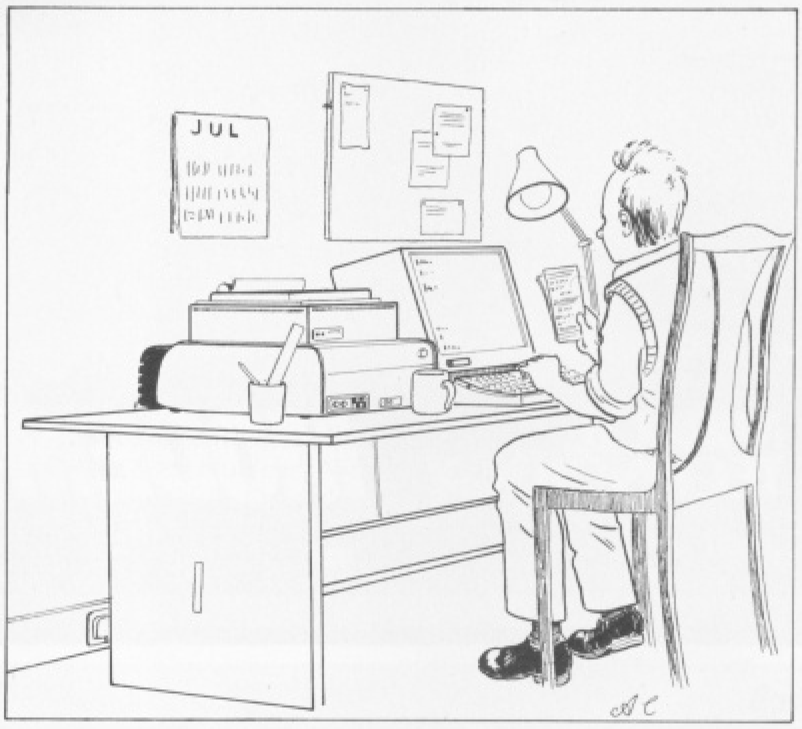
Designer T-shirts at 12½ years old

Touch Line

Kempston: Unit 4, Manton Lane, Bedford MK41 76HY. 0234 327544.
Micro Peripherals: Intec Building 2, Units 3 & 4, Hassocks Wood, Wade Road, Basingstoke, Hants RG24 0NE. 0256 473232.
Citizen: Burston Marstellar, 25 North Row, London W1R 2BY. 01 499 0414.
Star Micronics: Craven House, 40 Uxbridge Road, Ealing London W5 2BS. 01 840 1800.
Miracle Technology: St Peters St, Ipswich IP1 1XB. 0473 216141.
Micronet: 8 Herbal Hill, London EC1R 5EJ. 01 278 3143.
Bug Byte: Liberty House, 222 Regent Street, London W1R 7DB. 01 439 0666.
Beyond: Wellington House, Upper St Martins Lane, London WC2H 9DL. 01 379 5683.
British Music Fair: Nick Harvey & Associates, Warwick House, 9 Warwick Street, London W1R 5RA. 01 734 5741.

COMPETITION

This month we give 128 owners a chance to add to their collection of utilities in our Timeworks competition.



THIS MONTH, WITH THE HELP OF Timeworks, we are able to offer a special competition for C128 owners.

There are three prizes each consisting of a set of utilities from Timeworks. There are three utilities in the set: *Swiftcalc 128*, a spreadsheet; *Wordwrite 128*, a wordprocessing package and *Data Manager 128*, a database.

It's a very easy to enter competition just read the Rules and How to Enter section and then pop your entry in the post.

How to Enter

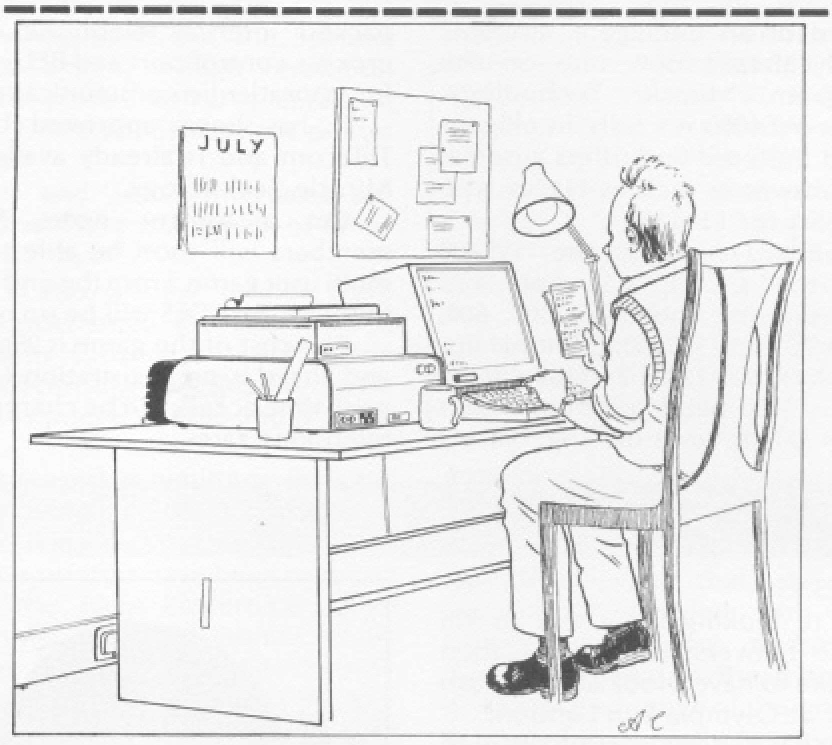
Study the pictures on this page. There are several differences between the two.

Mark the differences on the picture which is attached to the entry coupon, then complete the rest of the coupon and send it to us. Make sure that you mark the differences very clearly. Write the number of differences you found on the back of your envelope.

The Rules

Entries will not be accepted from employees of Argus Specialist Publications and Timeworks. This restriction applies to employee's families and agents off the company.

The How to Enter section forms part of the rules. The editor's decision is final and no correspondence will be entered into.



Timeworks Competition
Entry Coupon

Name ....
Address ....
....
....
....
postcode ....
Number of differences found ....

Send your entry to: Timeworks Competition, Your Commodore, 1 Golden Square, London W1R 3AB.
Closing date: Friday 26 September 1986.
Write clearly and fully and don't forget to write the number of differences you found on the back of your envelope.

Evesham Micros

ALWAYS A STEP AHEAD

DOUBLER

The tape back up "device"

Doubler has been an **enormous success** and continues to sell very well. Why? Because it is the **best product of its type** on the market. Doubler uses a unique method that copies **all types of software** regardless of speed. It consists of **hardware and software**. The software is the key part as unlike other products of its type Doubler creates a **brand new machine copy**. It is very easy to use and very successful. In fact our tests **have proved** that this "device" can achieve **100% success**.
Requires access to two data recorders.

ONLY £12.95

Why settle for less—this is the best.

ALIGNMENT PROBLEMS?

1541 PHYSICAL EXAM

£39.95

The program includes a digital alignment disc and software which allows you to ***accurately check and correct*** *disc drive alignment. The instruction booklet is* ***very detailed****. Also includes quiet drive stops to* ***stop*** *that "hammering" thus preventing further problems.*

ONLY £39.95

NEW MK.III VERSION

DISC DISECTOR V5.0

Now the **FIFTH generation** of the country's **leading** disc back-up/utility package is available. This latest version includes **many more "PARAMETERS" to handle the latest highly protected discs.**

"EVESHAM 3 MINUTE NIBBLER" is the **latest version** of the infamous "Evesham Nibbler" now boasting **even more power and speed. Will now copy even the most highly protected discs in 3-4 minutes.** Handles the latest types of disc protection **completely automatically.** This often involves the use of the **"PARAMETER COPIER"** which adds the vital secret code that the highly protected programs check for (This is the important difference that makes this the best). At the time of going to press this program copied **virtually every disc program available for testing including the latest in games and business software.**

"DUAL DRIVE NIBBLER" allows the use of two drives to make **even faster back-ups.** Incorporates device number change software so no hardware mods necessary.

"NOVA TRANSFER" will **transfer to disc** the latest Nova Load programs including **multi part loaders.** A very useful utility that also includes routines to transfer "Summer Games II" and "Beach-Head II" to disc.

"DISCO" will transfer standard speed load software to disc.

"TRANS QD" allows you to save a fast load system to your own discs.

"DOUBLE BACK UP" is a **very fast** two drive back up.

As well as these important newcomers all the old favourite utilities which have helped earn "Disector" such a large following are included. These include **Menu Maker (selective), Fast Format, Unscratch, Disc Monitor, Disc Orderly, Fast File Copy, Index, etc., etc.**

The whole package is menu driven and has its own fast boot system built in for your convenience. Pays for itself the first day you receive it.

ONLY £29.95

Customers with earlier versions may return them along with a payment of £9.95 to receive V5.0

Programs are CBM 128 and 1570/71 compatible in '64 mode.

Quickdisc+

FAST LOAD PLUS UTILITY CARTRIDGE

After enjoying considerable success since its release we have now made some improvements to "QUICKDISC+" to maintain its position as the best value in the disc "speed up/utility" cartridges.

Fast LOAD (now 5-7 times normal speed). Works with majority of protected software. Can be switched in and out from the keyboard.

Fast SAVE at 7 times normal speed.

Fast Format takes just 20 seconds.

Fast Backup copies an entire disc in four minutes (not protected software).

Very Fast File Copier for selective file copying at HIGH speed. Now handles files up to **248 blocks** long.

Improved DOS commands (DOS 5.1) makes for easy use of the disc drive. eg. $[RETURN] will LOAD and display a directory without overwriting BASIC. SHIFT RUN/STOP will LOAD "0:*",8,1 etc. **Very, very useful.**

Incorporates Centronics printer software (user port) **with CBM graphics** capability (requires user port centronics cable).

A RESET switch is fitted. (We have found this to be "unstoppable", it even preserves the tape buffer).

NO MEMORY IS USED by this cartridge, it is totally "transparent" and uses special switching techniques.

"128" and 1570 compatible in '64 mode.

PLUS MANY MORE USEFUL FEATURES TO MAKE YOUR 1541 FAR MORE FRIENDLY TO OPERATE.

ONLY £19.95

When reviewing "Quickdisc+" Commodore Horizons said: **"A MUST FOR EVERY 1541 OWNER".**

NOW EVEN FASTER

FREEZE FRAME

THE BEST IN BACKUP METHODS IS NOW EVEN BETTER

NOW HANDLES PROGRAMS THAT LOAD SUBSEQUENT PARTS

"Freeze Frame MKII" must have been the **world's most powerful and most successful** backup product. The success of "Freeze Frame" spawned several imitators but they are pale imitations of, what we are convinced, is the **most advanced and easy to use backup product in the entire world.**

Now the **"MKIII" version** has moved "Freeze Frame" well ahead of the "opposition". As well as its unfailing skill in handling **every memory resident program** available for testing up to 1st July 1986 it will now transfer from tape to disc the vast majority of **programs that load subsequent parts.**

FEATURES

- TAPE TO DISC
- DISC TO DISC
- COMPLETELY SELF CONTAINED, NO EXTRA SOFTWARE NEEDED
- FILES COMPRESSED FOR ECONOMY OF STORAGE SPACE
- 128/128D COMPATIBLE IN 64 MODE
- TAPE TO TAPE
- DISC TO TAPE
- RELOAD INDEPENDENT OF THE CARTRIDGE
- NOW HANDLES PROGRAMS THAT LOAD EXTRA PARTS
- PROGRAMS RESTART FROM THE POINT BUTTON IS PRESSED

OPERATING "FREEZE FRAME"

"Freeze Frame" is **simplicity itself** to use. It is cartridge based so is simply plugged into the cartridge port. When the computer is switched on a message is displayed, pressing "RETURN" will clear the computer back to the normal start up screen. Software can now be loaded from tape or disc **completely as normal.** The latest version of "Freeze Frame" will, to the best of our knowledge, allow **ANY software** to load and run normally (unlike competitive products).

"Freeze Frame" can be brought into operation at any convenient point by **pressing the button** on it. You can then do one of three things:—

1. **Pressing "D" will save a working version of the program in memory to a formatted disc. This version will include an auto booting very high speed reload (many programs reload in less than 30 secs).**
2. **Pressing "S" will save to disc with a standard reload speed that can be used by non 1541/70/71 drives U.S. spec. machines, etc., but perhaps more importantly by most fast load cartridges and systems. Use "Dolphin DOS" to reload anything in less than 10 secs. (Also suitable for U.S. spec. machines.)**
3. **Pressing "T" will save a working version of the program in memory to tape. This incorporates a high speed reload at approx. 2400 baud.**

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Well, I'm sure that we have all had problem before now. When it does happen it's a matter of spending hours searching through the program for any typing mistakes. No matter how long you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

Here, at Your Commodore, we pride ourselves on the quality of listing that we print. Unfortunately, this usually means that they are also very long, thus taking longer to type in and leaving more room for errors. All of the listings in Your Commodore are taken straight from a printout of working programs, it is therefore very unusual for errors to appear in the magazine.

Because of the length of our programs we do get a large number of requests from readers who would like us to put specific programs on tape or disk for them. Obviously this is very time consuming and means that we can't spend as much time working on the magazine as we would like.

The *Your Commodore* Software Service makes available all of the programs for the C64 or C128 on disk or tape published in *Your Commodore*. The cost of a cassette is £4.00 and a disk will cost £6.00.

Unless otherwise stated all C64 and C128 programs are available on the one cassette so you simply need to order the one cassette.

None of the programs are protected and we suggest that you make back up copies before you use the programs.

All programs on the cassette will be saved using a tape turbo routine. However, we cannot guarantee that all programs will work correctly with this turbo routine present. We therefore recommend that before you use any of the programs you make a copy of the programs on your own cassette or disk and use this version of the program **not** the original.

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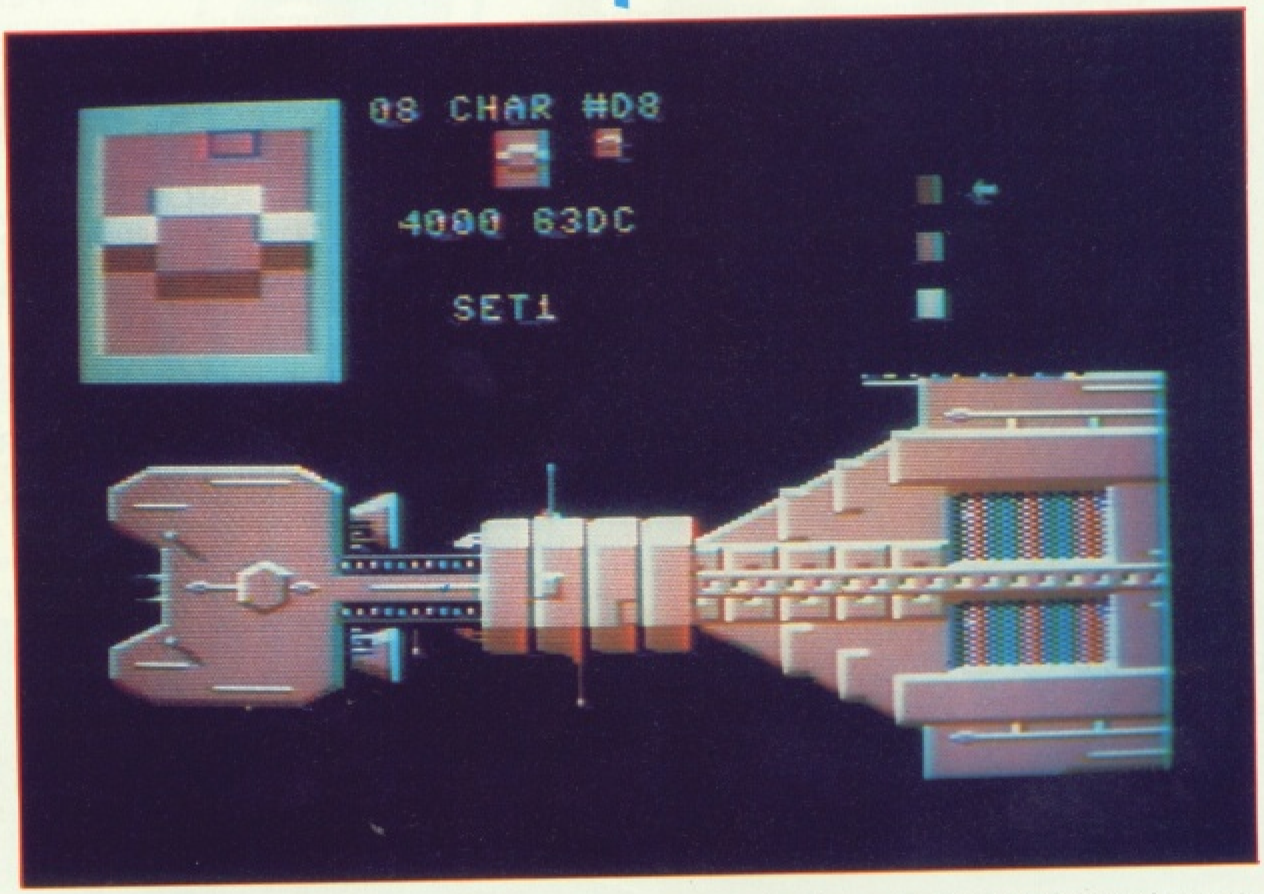
....

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3 into 1 E

Tony Crowther provides some sample screens for use with his graphics editor.



NO MATTER HOW GOOD A game is, the quality of its graphics always determines whether people will give it a second look or not. For example you could design the world's best shoot'em-up but if the graphics were simply blocks flying around the screen I doubt that many people would play the game for too long.

I hope that with my graphics editor, which was published in the August issue of *Your Commodore*, you will now be able to sit down and design great screens for your latest programs.

To help you on your way you will find with this article a few sample graphics routines. They are all printed in the form of Basic Loaders and will generate a machine code file on tape or disk as with the program itself.

If you do get any errors while typing the programs in, refer back to the August *Your Commodore*, to find out exactly what each error is and how to cure it. It is also worth pointing out at this stage that you will not be able to use these screens or view them without using the editor — for the moment at least.

The Programs

DRAK.CHAR and DRACK. BAK are the user-defined graphics and the background from a new game that I am writing. The background file is designed to be $FF (255) (characters wide by $15 (21) characters deep. When you load background into memory do remember to set the window size to FF*15 or you will not be able to see what it is. Even though the graphics background is 244 characters wide I have only presented a small section of it here in the magazine. The rest is blank, so why not try to continue the background yourself? Remember you must also have the characters present in order to see the background.

SHIP.CHAR and SHIP. BAK are the characters and background for a fantastic spaceship background. I'm afraid this isn't one of mine but is by P.A. Eves who has kindly given permission for us to use it in this article. This screen is $FF wide by $19 deep. Again only a small section of the screen is present so you can try to add your own ships.

Finally SPRITES is a collection of the sprites from my latest game TRAP marketed by Alligata. LOAD them into the sprite editor section of the 3INTO1 EDITOR and have fun playing them.

A few points worth noting are:

1) All the screens and graphics are in multi-colour mode so do remember to turn multi colour on.

2) The sprites are multi-colour.

3) DON'T LOAD the .GEN programs into the editor. These are just the programs that will generate the actual data files on your cassette or disk.

4) If using cassette, don't forget to change the device number in each section of the program before attempting to LOAD any data.

Pull Down Menus

At the end of last month's article I had to add a brief section about pull down menus. I made a last minute decision to add these menus for a couple of reasons:

1) It looks pretty.

2) When SAVEing data it can become very confusing working out which data you are actually saving. For example you could think that you were in the character editor and press the keys to save only to find at some later stage that you actually saved the background. On the pull down menus each of these commands are now separate.

Using the menus is very simple. Press the F7 key and the menus will appear on screen displaying all of the available commands. Move the reversed bar to the command that you want using the up and down cursor keys and press RETURN to activate the command. To exit the menu you just press F7 again.

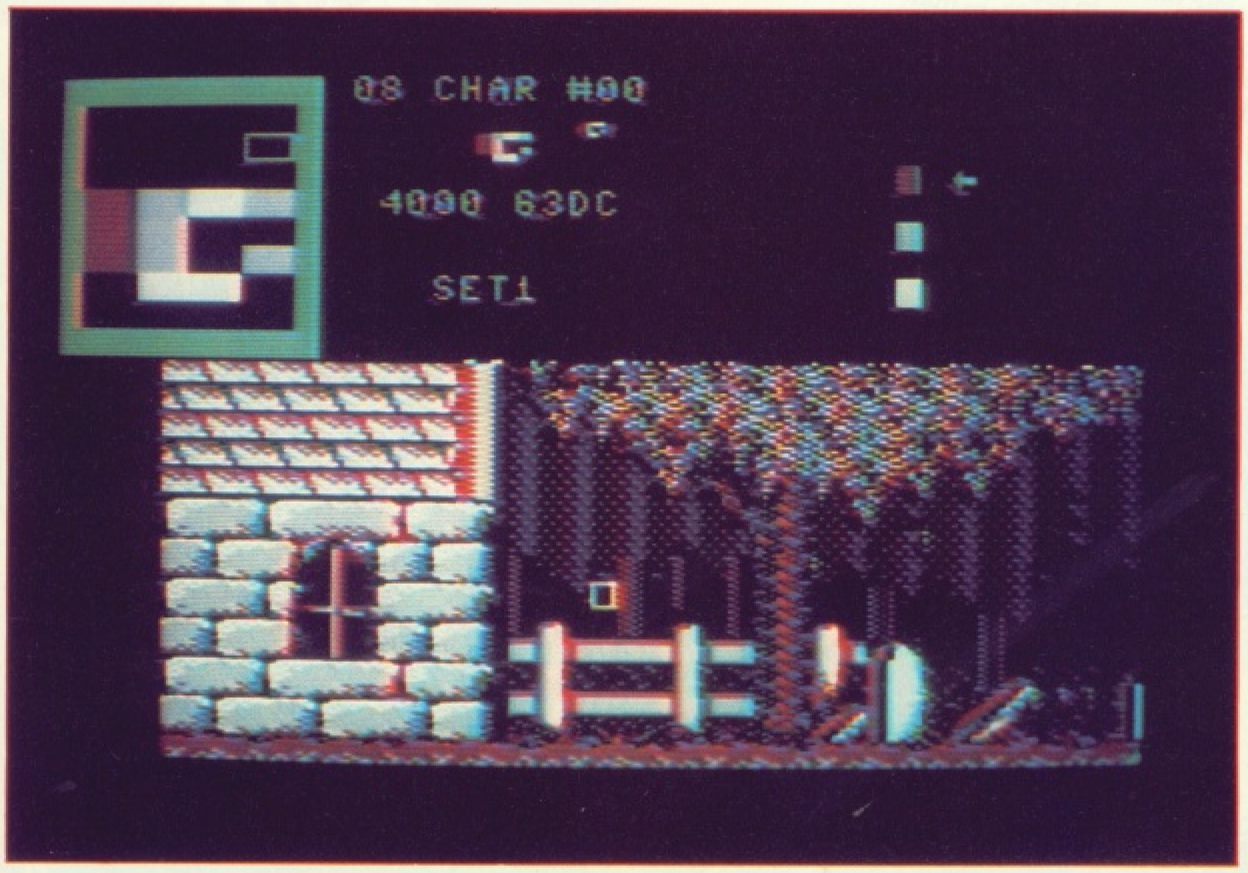
More to Come

Obviously there will be many people reading this article who have no idea what user defined graphics are or how to use them. When it comes to scrolling a background even people who are good at programming sometimes have problems.

However, don't despair. In a future issue of *Your Commodore* I will be starting a small series of articles that explain just how professional programmers achieve their effects. Any graphics will be compatible with the 3INTO1 EDITOR. PLUS I will be giving you some routines that you can use in your own programs to animate characters, backgrounds etc.

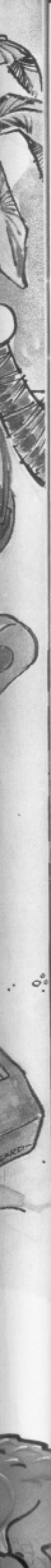
Until then, have fun with the editor, and, if you don't think that your fingers are up to typing all of this data, then don't forget that the backgrounds are available on this month's cassette and disk and the editor is on the August cassette and disk.

EDITOR



PROGRAM: DRACK.CHARS.GEN

```
1000 REM TYPE THIS PROGRAM I
N AS NORMAL
1010 REM THEN SAVE IT TO TAP
E OR DISK,
1020 REM DO NOT RUN IT YET !
!!!!!
1030 REM NOW TYPE NEW AND EN
TER THE
1040 REM FOLLOWING LINES:
1050 REM POKE 43,0 :POKE 44,
32
1060 REM POKE 8191,0:NEW
1070 REM NOW LOAD THE PROGRA
M AND RUN.
1080 REM THE PROGRAM WILL SA
VE THE CODE
1090 REM TO DISK. NOTE CHANG
ES AT END
1100 REM FOR TAPE.
2000 FORL=0TO128:CX=0:FORD=0
TO15:READA:CX=CX+A:POKE2048+
L*16+D,A:NEXTD
2010 READA:IFA<>CXTHENPRINT"
ERROR IN LINE";2040+(L*10):S
TOP
2020 NEXTL
2040 DATA0,0,0,110,96,98,60,
0,24,160,102,59,137,102,102,
0,1050
2050 DATA124,102,102,124,102
,102,65,0,60,102,96,96,96,10
2,60,0,1333
2060 DATA120,108,102,102,102
,5,120,0,126,96,4,120,133,96
,126,0,1360
2070 DATA126,96,148,120,96,9
6,96,120,60,97,96,110,102,10
2,60,20,1545
2080 DATA102,96,102,126,102,
102,102,0,60,24,24,24,24,24,
60,0,972
2090 DATA30,12,12,12,12,108,
56,0,102,108,120,112,45,177,
56,0,962
2100 DATA96,78,96,96,96,96,1
26,0,99,119,127,107,99,99,99
,0,1433
2110 DATA102,118,126,126,110
,102,102,0,60,102,102,102,10
2,102,60,0,1416
2120 DATA124,102,102,124,96,
96,96,0,60,102,102,102,102,6
0,14,0,1282
2130 DATA124,102,102,124,120
,108,102,0,60,102,96,60,6,10
2,60,0,1268
2140 DATA126,24,24,24,24,24,
24,0,102,102,102,102,102,102
,60,0,942
2150 DATA102,102,102,102,102
,60,24,0,99,99,99,107,127,11
9,99,0,1343
2160 DATA102,102,60,24,60,10
2,102,0,102,102,102,60,24,24
,24,0,990
2170 DATA126,6,12,24,48,96,1
26,0,16,85,85,85,85,102,89,1
05,1090
2180 DATA81,21,85,85,85,85,8
9,102,64,84,85,85,85,149,101
,154,1440
2190 DATA16,81,84,85,85,89,8
6,102,71,17,117,97,171,186,1
74,170,1631
2200 DATA0,0,0,0,0,0,0,0,73,
29,119,37,168,170,171,173,94
0
2210 DATA186,186,186,234,238
,59,140,2,234,170,186,203,14
2,227,56,195,2644
2220 DATA170,170,234,238,58,
184,143,48,170,170,235.162.1
62,255,51.3.2453
2230 DATA170,174,170,174,235
,232,51,204,0,31,126,123,126
,123,126,58,2123
2240 DATA0,255,238,186,170,1
70,170,170,0,238,171,170,170
,170,170,170,2618
2250 DATA84,237,187,174,170,
169,169,169,58,57,26,22,69,1
87,234,170,2182
2260 DATA170,170,170,153,5,1
89,175,171,170,170,102,85,4,
31,126,123,2014
2270 DATA101,153,101,84,5,25
5,238,186,170,170,170,170,17
0,169,102,85,2329
2280 DATA165,169,165,153,165
,153,101,84,126,58,122,42,58
,106,122,30,1819
2290 DATA170,170,170,170,170
,170,106,153,170,170,102,85,
0,64,144,144,2158
2300 DATA101,153,101,84,0,0,
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71
2310 DATA0,128,160,96,64,80,
64,64,64,0,0,0,0,64,144,64,9
92
2320 DATA155,86,27,86,27,22,
91,22,144,160,144,160,144,16
0,144,160,1732
2330 DATA69,86,151,102,182,2
29,189,0,85,101,153,230,187,
238,255,0,2257
2340 DATA43,43,43,43,43,43,4
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,0,1218
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5,175,23,17,0,68,0,85,85,85,
0,1172
2360 DATA0,0,0,0,23,43,43,43
,43,43,43,43,85,91,86,91,677
2370 DATA16,0,4,0,80,64,148,
160,17,0,68,0,21,69,69,16,73
2
2380 DATA65,80,65,4,64,0,16,
0,80,65,80,4,64,0,1,0,588
2390 DATA83,83,83,83,83,83.8
3,83,250,254,250,236,250,232
,178,200,2514
2400 DATA255,254,255,255,254
,251,254,254,254,254.254,255
,255,255,255,255,4069
```



```
2410 DATA0,1,5,20,20,20,84,8
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54,1627
2420 DATA5,5,21,21,84,84,82,
82,75,78,45,37,184,148,208,8
0,1239
2430 DATA0,0,0,0,20,85,84,82
,69,70,26,30,105,101,161,148
,981
2440 DATA145,144,68,64,80,20
,4,69,0,1,16,1,64,16,1,65,75
8
2450 DATA17,5,81,4,17,69,21,
4,16,68,81,84,16,68,80,69,70
0
2460 DATA0,85,85,170,170,170
,170,170,0,0,0,0,21,87,111,1
11,1350
2470 DATA111,111,107,91,107,
91,102,90,111,111,111,111,11
1,111,111,111,1698
2480 DATA4,16,1,64,16,20,4,6
9,0,21,21,90,90,90,90,90,686
2490 DATA88,86,84,81,84,81,6
8,17,111,111,111,26,70,17,68
,1,1104
2500 DATA64,1,16,4,64,4,65,6
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2510 DATA0,0,1,68,16,65,64,4
,69,21,20,21,69,16,4,17,455
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0,0,4,0,64,0,64,16,261
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,152,6,34,25,98,132,37,145,6
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0,877
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,863
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,17,0,68,0,1,4,0,0,260
2590 DATA17,0,4,0,0,1,0,0,17
,0,4,0,0,16,0,0,59
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103,25,1133
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0,170,102,85,17,70,153,153,9
53
2630 DATA102,153,101,85,145,
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64,1201
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0,9,9,9,9,9,9,9,9,474
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65,81,68,41,74,66,36,41,74,7
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,65,82,84,73,73,2,18,0,68,77
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129,4,20,132,161,5,81,148,36
,72,1353
2700 DATA68,80,65,80,80,148,
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849
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,153,153,195,255,2664
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,159,159,255,195,153,153,153
,153,195,241,255,2798
2770 DATA131,153,153,131,135
,147,153,255,195,153,159,195
,249,153,195,255,2812
2780 DATA129,231,231,231,231
,231,231,255,153,153,153,153
,153,153,195,255,3138
2790 DATA153,153,153,153,153
,195,231,255,156,156,156,148
,128,136,156,255,2737
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,153,153,255,153,153,153,195
,231,231,231,255,3090
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,159,129,255,195,207,207,207
,207,207,195,255,3282
2820 DATA243,237,207,131,207
,157,3,255,195,243,243,243,2
43,243,195,255,3300
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,231,231,231,255,239,207,128
,128,207,239,255,3392
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,153,153,255,2754
2860 DATA231,193,159,195.249
,131,231,255,157,153,243,231
,207,153,185,255,3228
2870 DATA195,153,195,199,152
,153,192,255,249,243,231,255
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2880 DATA243,231,207,207,207
,231,243,255,207,231,243,243
,243,231,207,255,3684
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,231,255,255,2981
2900 DATA255,255,255,255,83,
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2910 DATA255,255,255,255,255
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231,207,159,255,3530
2920 DATA195,153,145,137,153
,153,195,255,231,231,199,231
,231,231,129,255,3124
2930 DATA195,153,249,243,207
,159,129,255,195,153,249,227
,249,153,195,255,3266
2940 DATA249,241,225,153,128
,249,249,255,129,159,131,249
,249,153,195,255,3269
2950 DATA195,153,159,131,153
,153,195,255,129,153,243,231
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,153,195,255,195,153,153,193
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,255,231,231,207,3912
2980 DATA241,231,207,159,207
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,129,255,255,255,3560
2990 DATA143,231,243,249,243
,231,143,255,195,153,249,243
,231,255,231,8,3303
3000 DATA255,255,255,0,195,2
55,49,255,247,227,193,128,12
8,227,193,255,3117
3010 DATA231,231,231,231,231
,231,231,231,255,255,255,0,0
,255,255,255,3378
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,255,255,255,0,0,255,255,255
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,207,207,207,3186
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15,199,231,231,3416
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31,255,255,255,3414
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,0,63,31,143,199,227,241,248
,252,1782
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3,63,1782
3080 DATA0,0,252,252,252,252
,252,252,255,195,129,129,129
,129,195,255,2928
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,227,247,255,3037
3100 DATA159,159,159,159,159
,159,159,159,255,255,255,248
,240,227,231,231,3214
3110 DATA60,24,129,195,195,1
29,24,60,255,195,129,153,153
,129,195,255,2280
3120 DATA231,231,153,153,231
,231,195,255,249,249,249,249
,249,249,249,249,3672
3130 DATA247,227,193,128,193
,227,247,255,231,231,231,0,0
,231,231,231,3103
3140 DATA63,63,207,207,63,63
,207,207,231,231,231,231,231
,231,231,231,2928
3150 DATA255,255,252,193,137
,201,201,255,0,128,192,224,2
40,248,252,254,3287
3160 DATA255,255,255,255,255
,255,255,255,15,15,15,15,15,
15,15,15,2160
3170 DATA255,255,255,255,0,0
,0,0,0,255,255,255,255,255,2
55,255,2805
3180 DATA255,255,255,255,255
,255,255,0,63,63,63,63,63,63
,63,63,2289
3190 DATA51,51,204,204,51,51
,204,204,252,252,252,252,252
,252,252,252,3036
3200 DATA255,255,255,255,51,
51,204,204,0,1,3,7,15,31,63,
127,1777
3210 DATA252,252,252,252,252
,252,252,252,231,231,231,224
,224,231,231,231,3850
3220 DATA255,255,255,255,240
,240,240,240,231,231,231,224
,224,255,255,255,3886
3230 DATA255,255,255,7,7,231
,231,231,255,255,255,255,255
,255,0,0,3002
3240 DATA255,255,255,224,224
,231,231,231,231,231,231,0,0
,255,255,255,3364
3250 DATA255,255,255,0,0,231
,231,231,231,231,231,7,7,231
,231,231,2858
3260 DATA63,63,63,63,63,63,6
3,63,31,31,31,31,31,31,31,31
,752
3270 DATA248,248,248,248,248
,248,248,248,208,208,244,212
```

```
,244,0,0,0,3100
3280 DATA11,223,95,95,95,0,0
,0,5,5,7,7,23,0,0,0,566
3290 DATA64,64,64,64,64,64,2
08,80,127,125,119,125,95,223
,223,223,1932
3300 DATA6,5,1,0,0,1,1,5,0,6
4,208,208,80,208,80,208,1075
3310 DATA5,93,85,87,159,127,
255,253,0,5,21,26,30,106,105
,25,1382
3320 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0
4000 REM READY TO SAVE. CHAN
GE ,8 IN
4010 REM LINE 4060 TO ,1
4020 REM IF USING CASSETTE
4030 PRINT "(CLR)(DOWN)(DOWN
)(DOWN)(DOWN) ANY KEY TO SAV
E"
4040 GETK$:IFK$=""THEN4040
4050 POKE 43,0:POKE 44,8:POK
E45,3:POKE46,16
4060 SAVE "DRAK.CHRS",8
```

PROGRAM: DRACK.BAK.GEN

```
100 PRINT "[CLEAR,DOWN2,SPC]
   THIS PROGRAM WILL GENERAT
   E THE"
110 PRINT " DRACK.BACK FILE
    ON DISK."
120 PRINT "[DOWN2,SPC]
   IF USING TAPE MAKE SURE
    THAT YOU HAVE"
130 PRINT " MADE THE CHANGES
    MENTIONED IN THE"
140 PRINT " REM STATEMENTS."
150 FOR X=16384 TO 24545
   :POKE X,32:NEXT X
1000 FOR L=0 TO 4:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 16384+L*16+
   D,A:NEXT D
1010 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1030+(L*10):STOP
1020 NEXT L
1030 DATA 68,69,68,69,68,69,
   108,69,108,108,108,64,108,
   104,105,100,1393
1040 DATA 101,100,100,100,
   100,101,100,100,100,101,
   100,100,100,100,101,100,
   1604
1050 DATA 100,101,100,100,
   100,102,102,102,101,102,
   101,100,100,100,100,105,
   1616
1060 DATA 102,100,101,102,
   100,102,100,102,100,100,
   101,102,100,101,100,101,
   1614
1070 DATA 100,100,101,100,0,
   0,0,0,0,0,0,0,0,0,0,0,401
1080 FOR L=0 TO 4:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 16639+L*16+
   D,A:NEXT D
1090 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1110+(L*10):STOP
1100 NEXT L
1110 DATA 69,68,69,108,69,
   108,108,108,108,108,108,
   62,61,106,101,101,1462
1120 DATA 100,100,102,100,
   101,100,100,101,101,100,
   100,101,102,101,100,100,
   1609
1130 DATA 101,102,100,101,
   100,102,102,100,100,100,
   100,101,100,101,100,104,
   1614
1140 DATA 102,100,100,102,
   100,100,101,101,100,100,
   102,100,102,104,104,102,
   1620
1150 DATA 104,105,104,105,0,
   0,0,0,0,0,0,0,0,0,0,0,418
1160 FOR L=0 TO 4:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 16894+L*16+
   D,A:NEXT D
1170 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1190+(L*10):STOP
1180 NEXT L
1190 DATA 69,69,108,108,108,
   108,69,108,108,108,108,60,
   108,101,104,105,1549
1200 DATA 101,102,100,100,
   100,101,100,100,100,101,
   100,100,100,100,101,100,
   1606
1210 DATA 100,101,102,100,
   101,102,102,100,101,101,
   100,101,100,100,101,102,
   1614
1220 DATA 101,100,100,101,
   100,100,102,100,100,100,
   101,100,100,102,104,102,
   1613
1230 DATA 102,107,106,107,0,
   0,0,0,0,0,0,0,0,0,0,0,422
1240 FOR L=0 TO 4:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 17149+L*16+
   D,A:NEXT D
1250 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1270+(L*10):STOP
1260 NEXT L
1270 DATA 67,63,67,63,67,63,
   67,63,67,63,67,65,66,104,
   105,101,1158
1280 DATA 102,100,102,100,
   101,102,100,101,100,100,
   101,102,101,100,101,100,
   1613
1290 DATA 100,102,100,100,
   102,102,101,100,100,102,
   100,100,100,100,105,105,
   1619
1300 DATA 104,104,105,100,
   100,100,101,101,100,100,
   104,105,103,104,102,102,
   1635
1310 DATA 102,107,106,107,0,
   0,0,0,0,0,0,0,0,0,0,0,422
1320 FOR L=0 TO 4:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 17404+L*16+
   D,A:NEXT D
1330 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1350+(L*10):STOP
1340 NEXT L
1350 DATA 59,58,59,58,59,58,
   59,58,59,58,59,56,57,106,
   107,104,1074
1360 DATA 103,102,102,100,
   102,101,100,100,101,101,
   102,101,100,102,100,101,
   1618
1370 DATA 102,103,101,102,
   105,102,100,101,102,100,
   102,100,100,100,107,104,
   1631
1380 DATA 105,106,102,105,
   100,100,101,102,104,105,
   104,105,108,106,107,102,
   1662
1390 DATA 102,107,106,107,0,
   0,0,0,0,0,0,0,0,0,0,0,422
1400 FOR L=0 TO 3:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 17659+L*16+
   D,A:NEXT D
1410 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1430+(L*10):STOP
1420 NEXT L
1430 DATA 58,59,58,59,58,59,
   58,59,58,59,58,56,57,112,
   104,105,1077
1440 DATA 100,101,100,101,
   100,100,101,102,100,100,
   101,100,101,100,102,103,
   1612
1450 DATA 101,100,102,103,
   104,102,100,100,102,100,
   100,101,101,104,105,106,
   1631
1460 DATA 107,98,106,107,83,
   103,104,105,106,107,106,
   107,108,106,107,102,1662
1470 FOR L=0 TO 3:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 17914+L*16+
   D,A:NEXT D
1480 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1500+(L*10):STOP
1490 NEXT L
1500 DATA 59,58,59,58,59,58,
   59,58,59,58,59,56,57,108,
   106,107,1078
1510 DATA 103,104,105,104,
   105,101,100,100,102,100,
   100,101,104,105,104,105,
   1643
1520 DATA 106,107,108,108,
   102,101,100,100,101,102,
   100,100,104,100,107,106,
   1652
1530 DATA 107,111,108,124,
   125,126,106,107,136,135,
   106,107,108,106,107,102,
   1821
1540 FOR L=0 TO 3:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 18169+L*16+
   D,A:NEXT D
1550 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1570+(L*10):STOP
1560 NEXT L
1570 DATA 58,59,58,59,58,59,
   58,59,58,59,58,56,57,108,
   108,108,1080
1580 DATA 108,112,104,105,
   107,103,101,100,100,101,
   100,101,105,104,105,107,
   1663
1590 DATA 108,108,108,108,
   105,104,105,101,100,100,
   102,100,104,105,108,108,
   1674
1600 DATA 108,108,108,124,
   126,125,127,136,135,105,
   106,107,108,106,107,102,
   1868
1610 FOR L=0 TO 3:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 18424+L*16+
   D,A:NEXT D
1620 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1640+(L*10):STOP
1630 NEXT L
1640 DATA 59,58,59,58,59,58,
   59,58,59,58,59,56,57,108,
   108,108,1081
1650 DATA 108,108,106,107,98,
   99,103,83,103,104,105,106,
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107,106,107,108,1658
1660 DATA 108,109,108,108,
   104,105,107,103,101,100,
   100,101,100,107,108,108,
   1677
1670 DATA 109,108,108,133,
   125,126,138,136,135,135,
   106,107,108,106,107,102,
   1889
1680 FOR L=0 TO 3:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 18679+L*16+
   D,A:NEXT D
1690 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1710+(L*10):STOP
1700 NEXT L
1710 DATA 39,40,41,42,39,40,
   41,41,42,39,41,42,54,108,
   108,108,865
1720 DATA 108,108,108,108,
   108,98,82,83,108,106,107,
   111,108,108,108,108,1667
1730 DATA 108,110,108,108,
   106,107,98,99,103,83,103,
   104,105,108,111,108,1669
1740 DATA 110,108,108,133,
   125,126,138,136,135,135,
   106,107,108,106,107,102,
   1890
1750 FOR L=0 TO 3:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 18934+L*16+
   D,A:NEXT D
1760 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1780+(L*10):STOP
1770 NEXT L
1780 DATA 43,44,45,46,43,117,
   118,115,45,43,45,46,55,
   108,108,108,1129
1790 DATA 108,108,108,109,
   108,108,83,83,108,108,109,
   108,107,108,108,108,1679
1800 DATA 108,111,109,111,
   108,108,108,98,82,83,108,
   106,107,111,32,108,1598
1810 DATA 111,109,111,124,
   126,125,127,136,135,135,
   106,107,108,106,107,102,
   1875
1820 FOR L=0 TO 3:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 19189+L*16+
   D,A:NEXT D
1830 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1850+(L*10):STOP
1840 NEXT L
1850 DATA 47,48,49,50,47,119,
   121,116,49,48,49,50,53,
   114,109,108,1177
1860 DATA 111,113,111,114,
   110,114,82,83,107,110,109,
   108,109,108,108,108,1705
1870 DATA 111,32,32,111,108,
   109,108,108,83,83,107,108,
   111,32,32,111,1386
1880 DATA 32,32,111,133,125,
   125,127,136,135,135,106,
   107,108,106,107,102,1727
1890 FOR L=0 TO 3:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 19444+L*16+
   D,A:NEXT D
1900 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1920+(L*10):STOP
1910 NEXT L
1920 DATA 39,40,41,42,39,54,
   121,32,39,40,41,42,54,114,
   32,110,880
1930 DATA 32,113,32,114,32,
   114,82,83,32,32,113,111,
   32,109,108,108,1247
1940 DATA 32,32,32,32,111,
   114,110,114,82,83,111,110,
   32,32,32,32,1091
1950 DATA 32,32,32,124,126,
   125,134,136,135,135,106,
   107,108,106,107,102,1647
1960 FOR L=0 TO 3:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 19699+L*16+
   D,A:NEXT D
1970 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1990+(L*10):STOP
1980 NEXT L
1990 DATA 43,44,45,46,43,123,
   122,120,45,44,45,46,55,
   114,85,32,1052
2000 DATA 32,113,32,85,32,
   114,82,83,85,32,113,32,32,
   32,113,111,1123
2010 DATA 32,32,32,32,32,114,
   32,114,82,83,111,32,32,32,
   32,32,856
2020 DATA 32,32,32,124,125,
   126,127,136,135,135,106,
   107,108,106,107,102,1640
2030 FOR L=0 TO 3:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 19954+L*16+
   D,A:NEXT D
2040 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2060+(L*10):STOP
2050 NEXT L
2060 DATA 47,48,49,50,47,53,
   121,32,49,48,49,50,53,84,
   87,89,956
2070 DATA 84,84,84,87,89,84,
   82,83,87,89,74,75,32,32,
   113,32,1211
2080 DATA 32,32,32,32,32,114,
   74,75,82,83,32,32,32,32,
   32,32,780
2090 DATA 32,32,32,133,126,
   125,127,32,135,135,106,
   107,108,106,107,102,1545
2100 FOR L=0 TO 3:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 20209+L*16+
   D,A:NEXT D
2110 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2130+(L*10):STOP
2120 NEXT L
2130 DATA 39,40,41,42,39,40,
   41,41,42,39,41,42,54,97,
   87,97,822
2140 DATA 97,97,97,87,97,97,
   82,83,86,97,70,73,97,97,
   113,78,1448
2150 DATA 97,97,97,74,75,114,
   70,73,82,83,97,97,74,75,
   97,97,1399
2160 DATA 97,97,97,124,125,
   126,134,97,97,97,74,75,
   108,106,107,102,1663
2170 FOR L=0 TO 4:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 20464+L*16+
   D,A:NEXT D
2180 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2200+(L*10):STOP
2190 NEXT L
2200 DATA 43,44,45,46,43,44,
   45,46,46,43,45,46,55,84,
   87,89,851
2210 DATA 84,84,84,87,89,84,
   82,83,90,78,70,72,107,81,
   76,77,1328
2220 DATA 107,107,107,70,72,
   114,70,72,82,83,81,76,70,
   72,107,107,1397
2230 DATA 107,107,107,133,
   125,126,127,107,107,107,
   70,72,107,107,107,81,1697
2240 DATA 78,32,106,107,0,0,
   0,0,0,0,0,0,0,0,0,0,323
2250 FOR L=0 TO 5:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 20719+L*16+
   D,A:NEXT D
2260 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2280+(L*10):STOP
2270 NEXT L
2280 DATA 47,48,49,50,47,48,
   49,50,47,48,49,50,53,92,
   91,92,910
2290 DATA 88,92,94,91,92,94,
   95,96,76,77,70,71,88,76,
   79,80,1359
2300 DATA 92,88,92,70,71,92,
   70,71,95,96,76,79,70,71,
   92,88,1313
2310 DATA 92,92,82,128,129,
   130,131,132,92,94,70,71,
   92,88,92,76,1591
2320 DATA 77,92,88,92,94,92,
   88,92,94,92,88,92,94,92,
   88,92,1447
2330 DATA 94,92,88,92,94,0,0,
   0,0,0,0,0,0,0,0,0,460
2340 FOR L=0 TO 47:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 20974+L*16+
   D,A:NEXT D
2350 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2370+(L*10):STOP
2360 NEXT L
2370 DATA 27,28,29,30,28,27,
   28,29,30,28,27,28,29,30,
   28,27,453
2380 DATA 28,29,30,28,27,28,
   29,30,27,28,29,30,28,28,
   27,28,454
2390 DATA 29,30,28,27,28,29,
   30,28,27,28,29,30,28,27,
   28,29,455
2400 DATA 27,28,29,30,28,30,
   28,27,27,28,29,30,28,28,
   29,30,456
2410 DATA 28,27,28,29,30,28,
   27,28,29,30,28,27,28,29,
   30,28,454
2420 DATA 27,28,29,27,27,28,
   29,30,28,28,27,28,29,27,
   28,29,449
2430 DATA 30,28,30,28,27,27,
   28,29,30,28,28,29,30,28,
   27,28,455
2440 DATA 27,28,29,30,28,29,
   30,28,27,28,29,30,28,27,
   28,29,455
2450 DATA 30,27,28,29,30,28,
   28,27,28,29,30,28,27,28,
   29,30,456
2460 DATA 28,27,28,29,30,28,
   27,28,29,30,28,27,28,29,
   30,28,454
2470 DATA 27,28,29,30,28,27,
   28,29,30,28,27,28,29,30,
   28,27,453
2480 DATA 28,29,30,28,27,28,
   29,30,28,27,28,29,30,28,
   27,28,454
2490 DATA 29,30,28,27,28,29,
   30,28,27,28,29,30,28,27,
   28,29,455
2500 DATA 30,28,27,28,29,30,
   28,27,28,29,30,28,27,28,
   29,30,456
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2510 DATA 28,27,28,29,30,28,27,28,29,30,28,27,28,29,30,28,454
2520 DATA 27,28,29,30,28,27,28,29,30,28,27,28,29,30,28,31,457
2530 DATA 33,31,31,33,31,33,31,31,33,31,33,31,31,33,31,33,510
2540 DATA 31,31,33,31,33,31,31,31,33,31,31,33,33,31,33,31,508
2550 DATA 31,33,31,33,31,31,33,31,31,33,31,33,31,33,31,31,508
2560 DATA 33,31,31,33,31,33,31,31,33,31,31,33,33,31,31,33,510
2570 DATA 31,33,31,31,33,31,33,31,33,33,31,33,31,31,33,31,508
2580 DATA 33,31,31,31,33,31,31,33,33,31,33,31,31,33,31,31,508
2590 DATA 33,31,33,31,31,33,31,31,33,33,31,31,33,31,33,31,510
2600 DATA 33,31,31,33,31,31,33,31,33,31,31,33,31,33,31,31,508
2610 DATA 31,33,31,31,33,33,31,33,31,31,33,31,33,31,31,33,510
2620 DATA 31,33,31,31,33,31,33,31,31,33,31,33,31,31,33,31,508
2630 DATA 33,31,31,33,31,33,31,31,33,31,33,31,31,33,31,33,510
2640 DATA 31,31,33,31,33,31,31,33,31,33,31,31,33,31,33,31,508
2650 DATA 31,33,31,33,31,31,33,31,33,31,31,33,31,33,31,31,508
2660 DATA 33,31,33,31,31,33,31,33,31,31,33,31,33,31,31,33,510
2670 DATA 31,33,31,31,33,31,33,31,31,33,31,33,31,31,33,31,508
2680 DATA 33,31,33,31,31,33,31,31,33,31,33,31,31,33,34,35,515
2690 DATA 36,37,38,34,35,36,37,38,34,35,36,37,38,34,35,36,576
2700 DATA 37,38,34,34,36,37,34,35,36,37,38,38,34,35,36,37,576
2710 DATA 38,34,35,36,37,38,34,35,36,37,38,34,35,36,34,35,572
2720 DATA 36,37,38,37,38,34,34,35,36,37,38,35,36,37,38,34,580
2730 DATA 35,36,37,38,39,35,36,37,38,34,35,36,37,38,34,35,580
2740 DATA 36,34,34,35,36,37,38,38,34,35,36,34,35,36,37,38,573
2750 DATA 37,38,34,34,35,36,37,38,35,36,37,38,34,35,34,35,573
2760 DATA 36,37,38,36,37,38,34,35,36,37,38,34,35,36,37,34,578
2770 DATA 35,36,37,38,38,34,35,36,37,38,34,35,36,37,38,34,578
2780 DATA 35,36,37,38,34,35,36,37,38,34,35,36,37,38,34,35,575
2790 DATA 36,37,38,34,35,36,37,38,34,35,36,37,38,34,35,36,576
2800 DATA 37,38,34,35,36,38,38,34,35,36,37,38,34,35,38,37,580
2810 DATA 38,34,35,36,37,38,34,35,36,37,38,34,35,36,37,38,578
2820 DATA 34,35,36,37,38,34,35,36,37,38,34,35,36,37,38,34,574
2830 DATA 35,36,37,38,34,35,36,37,38,34,35,36,37,38,34,35,575
2840 DATA 36,37,38,34,0,0,0,0,0,0,0,0,0,0,255,255,655
3000 REM ***** READY TO SAVE *****
3010 REM * CHANGE ,8 IN LINE [SPC5]*
3020 REM * TO ,1 IF USING TAPE.[SPC2]*
3030 REM *************************
3035 PRINT "[CLEAR,DOWN4,SPC7]PRESS ANY KEY TO SAVE"
3040 GET K$:IF K$=""THEN 304
3050 POKE 43,0:POKE 44,64:POKE 45,225:POKE 46,95
3060 SAVE "DRACK.BACK",8
```

3 into 1 EDITOR

PROGRAM: SHIP.CHARS.GEN

```
1000 REM TYPE THIS PROGRAM IN AS NORMAL
1010 REM THEN SAVE IT TO TAPE OR DISK,
1020 REM DO NOT RUN IT YET !!!!!!
1030 REM NOW TYPE NEW AND ENTER THE
1040 REM FOLLOWING LINES:
1050 REM POKE 43,0 :POKE 44,32
1060 REM POKE 8191,0:NEW
1070 REM NOW LOAD THE PROGRAM AND RUN.
1080 REM THE PROGRAM WILL SAVE THE CODE
1090 REM TO DISK. NOTE CHANGES AT END
1100 REM FOR TAPE.
2000 FORL=0TO128:CX=0:FORD=0TO15:READA:CX=CX+A:POKE2048+L*16+D,A:NEXTD
2010 READA:IFA<>CXTHENPRINT"ERROR IN LINE";2040+(L*10):STOP
2020 NEXTL
2040 DATA255,255,234,234,234,234,234,234,255,255,170,170,170,170,170,170,3444
2050 DATA255,253,169,169,169,169,169,169,255,253,233,233,233,233,233,233,3428
2060 DATA255,253,233,233,233,233,213,85,233,233,233,233,233,233,213,85,3434
2070 DATA165,165,149,149,149,149,149,149,170,170,170,169,169,165,165,165,2567
2080 DATA170,170,190,190,190,190,170,170,0,0,0,0,0,0,0,0,1440
2090 DATA0,0,0,0,0,0,192,0,0,0,0,0,0,0,3,195
2100 DATA64,0,0,0,0,0,0,1,0,0,0,0,0,0,0,65
2110 DATA0,0,0,0,0,0,0,85,87,107,107,107,107,127,255,982
2120 DATA0,0,0,255,170,0,0,0,0,160,80,168,80,160,192,1265
2130 DATA136,168,8,10,8,24,42,235,0,0,10,21,42,21,10,7,742
2140 DATA0,0,0,63,106,96,184,0,0,170,85,170,85,170,255,1384
2150 DATA0,0,0,248,172,12,42,84,84,84,84,84,84,0,0,978
2160 DATA85,85,85,85,85,85,0,0,85,85,85,85,85,85,213,213,1446
2170 DATA85,85,85,170,170,170,85,85,170,170,170,170,170,170,149,85,2189
2180 DATA234,106,90,86,85,85,85,85,255,191,170,170,170,170,170,170,2322
2190 DATA169,169,169,169,169,105,89,85,149,149,149,149,149,149,149,21,2188
2200 DATA0,0,0,0,0,0,0,171,175,191,255,85,149,165,169,1360
2210 DATA0,0,0,0,0,0,0,255,170,150,158,158,190,170,85,1336
2220 DATA0,0,0,0,0,0,0,170,170,85,85,85,85,255,255,1190
2230 DATA0,0,0,0,0,0,0,170,170,170,170,170,170,170,170,106,1296
2240 DATA234,234,234,234,234,234,234,234,170,170,170,170,170,170,170,170,3232
2250 DATA169,169,169,169,169,169,169,169,106,90,154,166,170,170,170,170,2548
2260 DATA0,0,0,0,0,0,48,170,234,250,254,254,250,234,170,1864
2270 DATA48,0,0,0,0,0,0,170,170,170,170,238,170,170,170,1476
2280 DATA0,0,0,0,0,0,0,170,238,170,170,170,170,238,170,1496
2290 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2300 DATA233,233,233,233,233,233,233,233,0,0,0,0,0,0,0,1864
2310 DATA255,255,170,170,170,170,85,85,0,0,0,0,0,0,0,1360
2320 DATA15,63,250,234,170,170,170,170,255,254,170,170,170,170,170,170,2771
2330 DATA170,170,170,170,106,90,21,5,0,1,171,83,171,83,171,255,1837
2340 DATA90,150,165,169,170,170,170,170,0,0,42,21,42,21,42,127,1549
2350 DATA170,170,170,170,171,175,190,250,170,170,170,170,170,170,86,85,2657
2360 DATA0,1,2,5,2,85,0,0,85,85,85,85,149,165,169,170,1088
```

```
2370 DATA149,165,169,170,170
,170,170,170,149,165,169,170
,170,170,85,85,2496
2380 DATA253,253,253,253,253
,253,253,253,85,85,85,85,149
,165,84,85,2847
2390 DATA127,255,255,255,255
,255,255,255,169,169,169,169
,169,105,89,85,3036
2400 DATA84,84,84,84,84,84,8
4,84,0,0,0,0,0,0,0,0,672
2410 DATA240,252,175,171,170
,170,170,170,85,85,85,85,85,
21,5,1,1970
2420 DATA234,234,234,234,106
,106,234,234,0,0,0,0,0,0,0,0
,1616
2430 DATA170,170,170,170,169
,165,84,80,0,0,0,0,0,0,0,0,1
178
2440 DATA234,234,234,234,234
,234,213,85,170,170,170,170,
170,170,85,85,2892
2450 DATA169,169,169,169,169
,169,85,85,170,170,170,186,1
82,150,165,169,2546
2460 DATA255,255,234,234,234
,234,233,233,255,253,169,169
,169,169,105,105,3306
2470 DATA0,0,0,0,0,0,0,0,3
2,0,0,0,1,128,0,161
2480 DATA0,0,0,0,0,0,0,0,0
,0,3,15,62,250,234,564
2490 DATA15,62,250,234,170,1
70,170,170,240,188,175,171,1
70,170,170,170,2695
2500 DATA0,0,0,192,240,188,1
75,171,165,150,90,106,170,17
0,170,170,2157
2510 DATA0,0,0,0,0,0,0,0,107
,107,107,107,107,107,107,107
,856
2520 DATA0,0,170,85,0,0,0,0,
8,8,8,8,8,24,42,235,596
2530 DATA0,0,0,0,0,0,0,0,12,
12,8,8,8,8,8,8,72
2540 DATA80,96,106,21,0,0,0,
0,101,101,101,36,36,36,36,36
,786
2550 DATA20,36,164,80,0,0,0,
0,36,36,36,36,36,36,170,170,
856
2560 DATA170,106,90,86,85,85
,85,85,4,4,4,4,4,4,12,12,840
2570 DATA170,170,170,170,170
,106,90,86,84,20,20,4,4,4,4,
4,1276
2580 DATA0,0,0,0,0,0,0,0,101
,101,101,101,101,229,239,255
,1228
2590 DATA0,0,0,0,0,0,0,0,255
,255,101,101,101,101,101,101
,1116
2600 DATA0,0,0,0,0,0,0,0,159
,2,0,1,1,0,2,159,324
2610 DATA0,0,0,0,0,0,0,0,170
,170,170,170,106,234,234,234
,1488
2620 DATA0,0,0,0,0,0,0,0,234
,234,234,234,170,170,170,170
,1616
2630 DATA170,170,171,175,190
,250,234,250,250,234,250,190
,175,171,170,170,3220
2640 DATA170,170,171,175,190
,250,234,255,255,171,175,190
,250,234,170,170,3230
2650 DATA170,170,234,250,190
,175,171,255,234,234,234,234
,234,234,170,170,3359
2660 DATA233,235,234,234,234
,234,213,85,233,233,169,169,
169,169,85,85,3014
2670 DATA107,107,107,107,107
,107,107,107,0,0,0,0,0,0,0,0
,856
2680 DATA170,170,170,169,165
,150,90,106,106,90,22,5,1,0,
0,0,1414
2690 DATA170,170,170,170,106
,90,22,5,170,170,170,170,169
,165,148,80,2145
2700 DATA169,165,148,80,64,0
,0,0,0,0,0,0,0,0,0,0,626
2710 DATA170,170,106,234,234
,234,234,234,0,0,0,0,0,0,0,0
,1616
2720 DATA85,87,19,71,51,207,
51,207,0,0,0,0,0,0,0,0,778
2730 DATA85,85,81,68,83,76,8
3,76,0,0,0,0,0,0,0,0,637
2740 DATA85,85,17,68,51,204,
51,204,0,0,0,0,0,0,0,0,765
2750 DATA87,76,83,76,83,76,8
3,76,0,0,0,0,0,0,0,0,640
2760 DATA0,0,0,0,85,0,0,0,
0,0,0,0,0,0,0,0,85
2770 DATA0,21,0,40,16,42,0,5
6,0,0,0,0,0,0,0,0,175
2780 DATA56,0,63,32,40,0,62,
0,0,0,0,0,0,0,0,0,253
2790 DATA255,255,255,255,255
,255,255,255,0,0,0,0,0,0,0,0
,2040
2800 DATA85,85,85,85,85,85,8
5,85,0,0,0,0,0,0,0,0,680
2810 DATA171,170,170,170,170
,170,170,170,0,0,0,0,0,0,0,0
,1361
2820 DATA191,191,191,191,191
,191,191,127,0,0,0,0,0,0,0,0
,1464
2830 DATA182,182,247,255,85,
117,182,182,0,0,0,0,0,0,0,0,
1432
2840 DATA85,85,106,106,106,1
06,106,106,85,85,170,170,170
,170,170,170,1996
2850 DATA85,87,171,171,171,1
71,171,171,170,170,170,170,1
70,170,170,106,2494
2860 DATA234,170,170,170,170
,170,170,170,170,170,170,106
,234,234,234,234,2976
2870 DATA234,234,234,234,234
,170,170,170,170,170,170,170
,190,170,170,170,3060
2880 DATA85,65,85,85,85,85,6
5,85,170,190,170,170,170,170
,190,170,2040
2890 DATA0,0,0,0,0,0,0,0,234
,234,234,234,234,234,170,170
,1744
2900 DATA0,0,0,0,0,0,0,0,169
,169,169,169,169,171,170,170
,1356
2910 DATA0,0,0,0,0,0,0,0,170
,170,170,170,170,170,169,169
,1358
2920 DATA0,0,0,0,0,0,0,0,51,
204,51,204,51,204,51,204,102
0
2930 DATA0,0,0,0,0,0,0,0,83,
76,83,76,83,76,127,255,859
2940 DATA0,0,0,0,0,0,0,0,83,
76,19,76,51,204,51,204,764
2950 DATA0,0,0,0,0,0,0,0,55,
207,55,207,55,207,255,255,12
96
2960 DATA0,0,0,0,0,0,0,0,51,
204,51,204,51,204,255,255,12
75
2970 DATA0,0,0,0,0,0,0,0,55,
207,55,207,55,207,55,207,104
8
2980 DATA0,0,0,0,0,0,0,0,127
,255,170,170,170,170,170,170
,1402
2990 DATA0,0,0,0,0,0,0,0,0,0
,255,0,0,0,0,0,255
3000 DATA0,0,0,0,0,0,0,0,0,0
,2,15,63,62,42,42,226
3010 DATA47,191,255,255,235,
171,171,171,85,21,5,1,0,0,0,
0,1608
3020 DATA85,85,85,85,0,1,5,2
1,170,170,170,255,85,149,85,
85,1536
3030 DATA255,255,170,255,85,
149,165,169,170,170,170,255,
85,149,165,169,2836
3040 DATA106,106,106,106,106
,106,106,106,0,0,0,0,0,0,0,0
,848
3050 DATA171,171,171,171,171
.171,171,171,169,169,149,149
,85,85,85,85,2344
3060 DATA85,85,106,106,106,1
06,107,107,85,87,171,171,171
,171,235,235,2134
3070 DATA106,106,106,106,106
,106,106,106,0,0,0,0,0,0,0,0
,848
3080 DATA170,170,170,255,85,
170,170,170,0,0,0,0,0,0,0,0,
1360
3090 DATA182,182,182,182,182
,182,182,182,0,0,0,0,0,0,0,0
,1456
3100 DATA170,170,255,255,85,
85,170,170,0,0,0,0,0,0,0,0,1
360
3110 DATA170,170,170,170,234
,250,190,175,0,0,0,0,0,0,0,0
,1529
3120 DATA170,170,190,235,105
,150,170,170,0,0,0,0,0,0,0,0
,1360
3130 DATA0,0,0,15,60,255,2
52,0,0,0,0,0,0,0,0,0,582
3140 DATA84,85,20,5,0,0,0,0,
0,0,0,0,0,0,0,0,194
3150 DATA0,124,0,20,4,252,0,
28,0,0,0,0,0,0,0,0,428
3160 DATA0,0,204,204,0,85,0,
0,0,0,0,0,0,0,0,0,493
3170 DATA0,0,170,0,204,204,0
,0,0,0,0,0,0,0,0,0,578
3180 DATA255,255,255,255,85,
255,255,255,0,0,0,0,0,0,0,0,
1870
3190 DATA170,170,255,85,170,
170,85,85,0,0,0,0,0,0,0,0,11
90
3200 DATA255,255,170,170,255
,85,170,170,42,42,22,21,5,1,
0,0,1663
3210 DATA171,171,171,107,87,
87,23,7,170,255,234,234,234,
234,234,255,2674
3220 DATA170,170,170,255,85,
182,182,182,0,0,0,0,0,0,0,0,
1396
3230 DATA182,182,182,255,85,
170,170,170,0,0,0,0,0,0,0,0,
1396
3240 DATA106,106,106,106,106
,106,127,255,170,170,170,170
,170,170,255,255,2548
3250 DATA171,171,171,171,171
,171,255,255,170,170,170,170
,170,170,169,165,2890
3260 DATA107,105,106,106,106
,106,127,255,107,107,171,171
,171,171,255,255,2426
3270 DATA170,255,235,235,255
,235,235,170,170,170,170,106
,90,150,165,169,2980
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3280 DATA0,0,0,0,0,0,0,0,171
,175,190,250,234,170,170,170
,1530
3290 DATA0,0,0,0,0,0,0,0,234
,250,190,175,171,170,170,170
,1530
3300 DATA0,0,0,0,0,0,0,0,170
,170,169,169,169,169,169,169
,1354
3310 DATA0,0,0,0,0,0,0,0,169
,171,170,170,170,170,170,170
,1360
3320 DATA255,255,255,255,255
,255,255,255,255,255,255,255
,255,255,255,255,4080
4000 REM READY TO SAVE. CHAN
GE THE,8 IN
4010 REM THE SAVE INSTRUCTIO
N TO ,1
4020 REM IF USING CASSETTE
4030 PRINT "(CLR)(DOWN)(DOWN
)(DOWN)(DOWN) ANY KEY TO SAV
E"
4040 GETK$:IFK$=""THEN4040
4050 POKE 43,0:POKE 44,8:POK
E45,3:POKE46,16
4060 SAVE "SHIP.CHRS",8
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PROGRAM: SHIP.BAK.GEN

```
10 PRINT "[CLEAR,DOWN2,SPC2]
   THIS PROGRAM WILL SAVE
   THE FILE"
20 PRINT "[DOWN,SPC2]
   SHIP.BAK TO DISK."
30 PRINT "[DOWN3,SPC2]
   IF USING TAPE MAKE SURE
   TO MAKE"
40 PRINT "[DOWN,SPC2]CHANGES
   AS IN REM STATEMENTS"
50 FOR X=16384 TO 22760
   :POKE X,32:PRINT"[HOME]";
   X;:NEXT X
60 POKE 16924,44
1000 FOR L=0 TO 6:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 17176+L*16+
   D,A:NEXT D
1010 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1030+(L*10):STOP
1020 NEXT L
1030 DATA 32,32,32,0,74,92,
   10,32,32,32,32,32,32,32,
   32,32,560
1040 DATA 32,99,32,32,32,32,
   32,32,32,32,32,32,32,19,
   21,17,540
1050 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
1060 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
1070 DATA 32,99,32,32,32,44,
   32,32,32,32,32,32,32,44,
   32,32,603
1080 DATA 32,32,32,32,11,89,
   56,1,1,1,1,32,32,32,32,32,
   448
1090 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
1100 FOR L=0 TO 6:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 17424+L*16+
   D,A:NEXT D
1110 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1130+(L*10):STOP
1120 NEXT L
1130 DATA 32,32,32,32,32,32,
   32,144,144,64,40,41,41,91,
   92,10,891
1140 DATA 32,32,32,32,32,32,
   32,32,97,32,32,32,32,32,
   32,32,577
1150 DATA 32,32,32,32,32,18,
   32,32,20,16,16,16,16,16,
   16,16,374
1160 DATA 22,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,502
1170 DATA 32,32,32,44,32,32,
   32,32,18,32,32,0,1,1,1,1,
   354
1180 DATA 1,1,1,1,1,1,2,32,
   32,11,89,90,41,41,41,41,
   426
1190 DATA 41,41,2,193,32,32,
   32,32,32,32,32,32,32,32,
   32,32,661
1200 FOR L=0 TO 6:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 17680+L*16+
   D,A:NEXT D
1210 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1230+(L*10):STOP
1220 NEXT L
1230 DATA 32,32,32,32,32,32,
   32,191,191,40,41,41,41,41,
   29,232,1071
1240 DATA 232,232,232,232,
   232,232,232,232,232,2,218,
   70,68,70,68,70,2654
1250 DATA 68,89,0,232,232,
   232,232,232,232,232,232,
   232,232,232,232,232,3173
1260 DATA 2,218,70,68,70,68,
   70,68,89,0,1,194,32,32,32,
   32,1046
1270 DATA 0,1,1,1,1,1,1,1,
   198,4,1,1,1,1,1,1,215
1280 DATA 1,1,1,1,1,2,4,1,2,
   41,41,41,41,41,41,41,301
1290 DATA 41,42,148,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,647
1300 FOR L=0 TO 6:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 17936+L*16+
   D,A:NEXT D
1310 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1330+(L*10):STOP
1320 NEXT L
1330 DATA 32,32,32,32,32,32,
   32,11,40,216,208,236,208,
   208,236,208,1795
1340 DATA 208,236,216,41,41,
   41,41,41,255,1,1,1,1,1,1,
   1,1127
1350 DATA 1,164,41,61,21,21,
   21,21,21,21,21,21,21,59,
   41,255,811
1360 DATA 1,1,1,1,1,1,1,1,
   164,41,234,32,144,144,64,
   40,871
1370 DATA 41,41,41,41,41,47,
   47,199,4,1,1,1,1,1,1,1,509
1380 DATA 1,1,1,1,2,4,104,71,
   41,41,41,41,41,41,41,41,
   513
1390 DATA 41,233,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,722
1400 FOR L=0 TO 6:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 18192+L*16+
   D,A:NEXT D
1410 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1430+(L*10):STOP
1420 NEXT L
1430 DATA 32,32,32,32,11,89,
   0,1,1,1,1,1,1,1,1,1,237
1440 DATA 1,1,1,1,1,1,1,1,1,
   1,1,2,0,1,1,1,16
1450 DATA 1,1,1,1,1,1,1,1,1,
   1,1,1,1,1,1,1,16
1460 DATA 1,1,1,1,1,2,41,41,
   41,32,32,32,32,218,40,41,
   557
1470 DATA 246,41,41,47,47,47,
   199,4,1,1,1,1,1,1,1,680
1480 DATA 1,1,1,2,4,152,72,
   104,41,41,41,41,41,41,41,
   249,873
1490 DATA 1,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,481
1500 FOR L=0 TO 7:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 18424+L*16+
   D,A:NEXT D
1510 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1530+(L*10):STOP
1520 NEXT L
1530 DATA 89,56,1,1,232,232,
   232,74,92,32,32,32,32,32,
   32,32,1233
1540 DATA 99,32,32,32,32,32,
   32,32,32,11,89,0,41,80,81,
   81,738
1550 DATA 81,81,81,81,81,81,
   81,81,163,41,41,41,33,0,1,
   1,969
1560 DATA 2,104,71,40,41,41,
   167,8,167,167,8,167,167,8,
   167,167,1492
1570 DATA 8,167,167,8,167,41,
   81,81,81,81,81,81,82,41,
   62,249,1478
1580 DATA 1,0,1,1,1,40,41,41,
   41,41,41,47,47,199,4,1,547
1590 DATA 1,1,1,1,1,1,1,1,1,
   1,2,4,152,72,152,41,433
1600 DATA 41,41,41,41,41,41,
   41,41,32,32,32,32,32,32,
   32,32,584
1610 FOR L=0 TO 8:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 18672+L*16+
   D,A:NEXT D
1620 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1640+(L*10):STOP
1630 NEXT L
1640 DATA 32,32,32,32,32,32,
   32,40,208,208,41,41,41,41,
   41,42,927
1650 DATA 193,194,32,32,32,
   32,32,97,32,32,32,32,32,
   32,11,89,936
1660 DATA 0,41,80,41,41,41,
   138,140,140,140,140,136,
   41,41,41,60,1261
1670 DATA 247,163,41,167,40,
   84,85,42,152,72,28,83,41,
   61,21,21,1348
1680 DATA 21,21,21,21,21,21,
   21,59,41,41,41,41,41,206,
   41,41,699
1690 DATA 41,41,41,62,249,
   164,41,84,40,41,41,33,40,
   41,41,41,1041
1700 DATA 41,41,41,41,41,3,
   138,140,140,140,140,140,
   140,140,140,140,1606
1710 DATA 140,136,3,152,72,
   152,41,41,41,41,41,41,41,
   41,41,32,1056
1720 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
```

```
   32,32,512
1730 FOR L=0 TO 8:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 18928+L*16+
   D,A:NEXT D
1740 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1760+(L*10):STOP
1750 NEXT L
1760 DATA 32,32,32,32,32,32,
   129,130,83,39,41,41,41,41,
   42,146,925
1770 DATA 234,32,32,218,70,
   68,150,68,70,68,70,68,89,
   90,41,80,1448
1780 DATA 41,41,41,41,41,142,
   177,177,177,177,187,41,41,
   41,41,41,1447
1790 DATA 60,165,167,40,124,
   125,42,152,72,152,41,43,
   41,0,1,1,1226
1800 DATA 1,1,1,1,1,1,1,1,1,
   1,1,1,1,1,2,41,57
1810 DATA 62,249,164,41,41,
   41,124,40,41,41,41,251,
   214,41,41,41,1473
1820 DATA 41,41,41,41,52,179,
   185,185,185,185,185,185,
   177,177,8,142,2009
1830 DATA 187,52,152,72,152,
   41,41,41,41,41,41,41,41,
   41,32,32,1048
1840 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
1850 FOR L=0 TO 8:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 19184+L*16+
   D,A:NEXT D
1860 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1880+(L*10):STOP
1870 NEXT L
1880 DATA 32,32,32,32,32,32,
   13,40,43,41,62,214,41,42,
   226,226,1140
1890 DATA 226,226,226,40,42,
   40,42,40,42,40,42,85,84,
   85,84,85,1429
1900 DATA 84,85,84,85,179,
   185,185,185,185,183,41,
   167,167,41,41,41,1938
1910 DATA 40,33,80,81,81,82,
   152,72,152,41,41,41,40,
   138,140,140,1354
1920 DATA 140,140,140,140,
   136,41,41,0,1,1,1,1,1,1,1,
   164,949
1930 DATA 41,41,41,41,41,66,
   40,41,41,41,41,154,251,
   214,41,41,1176
1940 DATA 41,41,33,52,41,41,
   41,41,41,41,41,142,177,52,
   142,187,1154
1950 DATA 52,196,72,152,41,
   41,41,41,41,41,41,41,41,
   32,32,32,937
1960 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
1970 FOR L=0 TO 8:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 19440+L*16+
   D,A:NEXT D
1980 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   1200+(L*10):STOP
1990 NEXT L
2000 DATA 32,32,32,32,32,113,
   40,216,208,40,42,216,41,
   41,208,208,1533
2010 DATA 208,208,40,42,4,42,
   40,42,40,42,35,35,35,35,
   35,35,918
2020 DATA 35,35,35,35,35,35,
   35,35,35,35,35,35,35,35,
   35,40,565
2030 DATA 41,66,65,152,152,
   152,72,152,41,41,41,40,
   142,177,177,177,1688
2040 DATA 177,177,177,187,41,
   33,40,61,21,21,21,21,59,
   41,41,41,1159
2050 DATA 41,41,41,41,41,40,
   169,169,169,169,169,41,
   154,40,41,41,1407
2060 DATA 41,41,52,61,21,21,
   21,21,59,41,54,54,52,54,
   54,4,651
2070 DATA 152,72,168,169,169,
   169,169,169,169,169,41,41,
   32,32,32,32,1785
2080 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2090 FOR L=0 TO 8:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 19696+L*16+
   D,A:NEXT D
2100 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2120+(L*10):STOP
2110 NEXT L
2120 DATA 32,32,32,32,11,40,
   41,41,60,93,41,42,224,224,
   224,224,1393
2130 DATA 224,40,42,40,42,40,
   42,40,42,125,124,125,124,
   125,124,125,1424
2140 DATA 124,125,138,140,
   140,140,140,136,41,167,
   167,41,41,41,40,33,1654
2150 DATA 0,1,1,2,104,30,40,
   41,41,41,40,179.185,185,
   185,185,1260
2160 DATA 185,185,183,41,41,
   80,81,81,81,81,81,81,81,
   163,41,41,1527
2170 DATA 41,41,41,41,40,41,
   41,41,41,41,62,249,164,41,
   41,41,1007
2180 DATA 33,52,41,41,41,41,
   41,41,41,138,140,52,138,
   136,52,196,1224
2190 DATA 72,152,41,41,41,41,
   41,41,41,41,41,32,32,32,
   32,32,753
2200 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2210 FOR L=0 TO 8:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 19952+L*16+
   D,A:NEXT D
2220 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2240+(L*10):STOP
2230 NEXT L
2240 DATA 32,32,89,90,83,39,
   41,41,41,41,42,148,194,
   105,32,220,1270
2250 DATA 31,72,31,72,31,72,
   31,72,129,130,41,0,41,41,
   41,41,876
2260 DATA 41,142,177,177,177,
   177,187,41,41,41,41,41,62,
   166,167,40,1718
2270 DATA 84,85,42,152,72,28,
   41,41,41,80,81,81,81,81,
   81,81,1152
2280 DATA 81,81,81,81,81,81,
   81,81,81,81,82,41,60,247,
   163,41,1444
2290 DATA 41,41,84,40,41,41,
   41,62,249,164,41,41,41,41,
   41,41,1050
2300 DATA 52,138,140,140,140,
   140,140,140,181,177,8,142,
   187,52,152,72,2001
2310 DATA 152,41,41,41,41,41,
   41,41,41,41,32,32,32,32,
   32,32,713
2320 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0
2330 FOR L=0 TO 8:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 20208+L*16+
   D,A:NEXT D
2340 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2360+(L*10):STOP
2350 NEXT L
2360 DATA 32,40,208,208,43,
   41,41,41,41,42,233,234,32,
   32,32,32,1332
2370 DATA 32,32,107,32,32,32,
   32,32,13,129,80,41,0,41,
   41,41,717
2380 DATA 179,185,185,185,
   185,183,41,41,41,62,249,
   164,41,167,40,124,2072
2390 DATA 125,42,152,72,152,
   83,41,61,21,21,21,21,21,
   21,21,21,896
2400 DATA 21,59,41,41,41,41,
   41,206,41,41,41,41,41,60,
   247,163,1166
2410 DATA 41,124,40,41,41,33,
   40,41,41,41,41,41,41,41,
   41,5,693
2420 DATA 179,185,185,185,
   185,185,185,185,185,185,
   185,183,5,152,72,152,2593
2430 DATA 41,41,41,41,41,41,
   41,41,41,32,32,32,32,32,
   32,32,593
2440 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0
2450 FOR L=0 TO 7:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 20464+L*16+
   D,A:NEXT D
2460 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2480+(L*10):STOP
2470 NEXT L
2480 DATA 129,58,81,81,230,
   230,230,78,132,32,32,32,
   32,32,32,32,1473
2490 DATA 32,105,32,32,32,32,
   32,32,32,32,129,80,41,0,1,
   1,645
2500 DATA 1,1,1,1,1,1,1,1,
   164,41,41,41,33,80,81,81,
   570
2510 DATA 82,152,72,152,41,
   43,167,8,167,167,8,167,
   167,8,167,167,1735
2520 DATA 8,167,167,8,167,41,
   189,1,1,1,1,1,2,41,60,247,
   1102
2530 DATA 67,80,81,81,81,40,
   41,41,41,41,41,47,47,199,
   4,80,1012
2540 DATA 81,81,81,81,81,81,
   81,81,81,81,82,4,152,72,
   152,41,1313
2550 DATA 41,41,41,41,41,41,
   41,41,41,32,32,32,32,32,
   32,32,593
2560 FOR L=0 TO 7:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 20720+L*16+
   D,A:NEXT D
2570 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2590+(L*10):STOP
2580 NEXT L
```

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2590 DATA 32,32,32,32,46,32,
   32,32,32,32,32,32,32,32,
   32,32,526
2600 DATA 32,32,32,32,32,32,
   32,32,32,32,13,129,80,81,
   81,81,785
2610 DATA 81,81,81,81,81,81,
   81,81,81,81,81,81,67,69,
   24,24,1156
2620 DATA 24,23,24,81,81,81,
   81,81,81,81,81,81,81,81,
   81,81,1124
2630 DATA 81,81,81,81,81,81,
   81,81,81,81,81,82,41,41,
   41,32,1128
2640 DATA 32,32,32,220,40,41,
   235,41,41,47,47,47,199,4,
   80,81,1219
2650 DATA 81,81,81,81,81,81,
   81,81,81,82,4,152,72,152,
   41,41,1273
2660 DATA 41,41,41,41,41,247,
   81,32,41,32,32,32,32,32,
   32,32,830
2670 FOR L=0 TO 6:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 21000+L*16+
   D,A:NEXT D
2680 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2700+(L*10):STOP
2690 NEXT L
2700 DATA 32,32,32,13,40,216,
   208,238,208,208,238,208,
   208,238,216,41,2376
2710 DATA 41,41,41,41,175,67,
   26,26,26,26,81,81,81,163,
   41,61,1018
2720 DATA 21,21,21,21,21,21,
   21,21,21,59,41,175,81,81,
   81,81,788
2730 DATA 81,81,81,81,163,41,
   194,32,32,32,32,40,41,41,
   41,41,1054
2740 DATA 41,47,47,199,4,80,
   81,81,81,81,81,81,81,81,
   81,81,1228
2750 DATA 82,4,152,72,152,41,
   41,41,41,41,41,41,41,193,
   32,32,1047
2760 DATA 81,81,81,81,81,81,
   81,81,81,82,4,152,72,152,
   41,41,1273
2770 FOR L=0 TO 6:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 21256+L*16+
   D,A:NEXT D
2780 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2800+(L*10):STOP
2790 NEXT L
2800 DATA 32,32,32,40.41.41.
   41,41,27,230,230,230,230,
   230,230,230,1937
2810 DATA 230,230,230,82,220,
   152,72,31,72,31,72,129,80,
   230,230,230,2321
2820 DATA 230,230,230,230,
   230,230,230,230,230,230,
   82,220,31,72,31,72,2808
2830 DATA 31,72,129,80,81,
   234,32,32,32,32,80,81,81,
   81,81,81,1240
2840 DATA 81,81,81,4,80,81,
   81,81,81,81,81,81,81,81,
   81,82,1219
2850 DATA 4,152,72,152,41,41,
   41,41,41,41,41,42,148,32,
   32,32,953
2860 DATA 81,81,81,81,81,81,
   81,81,81,82,4,152,72,152,
   41,41,1273
2870 FOR L=0 TO 6:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 21504+L*16+
   D,A:NEXT D
2880 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2900+(L*10):STOP
2890 NEXT L
2900 DATA 32,32,32,32,32,32,
   32,144,144,64,40,41,41,
   131,132,12,973
2910 DATA 46,32,32,32,32,32,
   32,100,96,96,96,96,96,96,
   96,96,1106
2920 DATA 96,96,96,96,96,96,
   102,32,32,32,32,32,32,32,
   32,32,966
2930 DATA 107,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,587
2940 DATA 32,32,32,46,32,32,
   32,32,32,32,32,31,152,152,
   152,152,1005
2950 DATA 152,152,152,152,
   152,152,72,32,32,32,195,
   130,41,41,41,41,1569
2960 DATA 41,41,82,233,32,32,
   32,32,0,0,0,0,0,0,0,0,525
2970 FOR L=0 TO 6:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 21768+L*16+
   D,A:NEXT D
2980 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   3000+(L*10):STOP
2990 NEXT L
3000 DATA 32,80,78,132,12,32,
   32,32,32,32,32,32,32,32,
   32,32,686
3010 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
3020 DATA 32,32,32,32,32,32,
   32,105,32,32,32,32,32,32,
   32,32,585
3030 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
3040 DATA 32,32,32,46,32,32,
   32,32,32,32,32,46,32,32,
   32,32,540
3050 DATA 32,32,13,129,130,
   81,81,81,81,32,32,32,32,
   32,32,32,884
3060 DATA 41,41,82,233,32,32,
   32,32,0,0,0,0,0,0,0,0,525
3500 POKE 22024,46
3510 REM ***** READY TO SAVE
   *****
3520 REM * CHANGE ,8 IN LINE
   3580*
3530 REM * TO ,1 IF USING
   TAPE[SPC3]*
3540 REM ********************
   ******
3550 PRINT "[CLEAR,DOWN4,
   SPC7]ANY KEY TO SAVE"
3560 GET K$:IF K$=""THEN 3560
3570 POKE 43,0:POKE 44,64
   :POKE 45,232:POKE 46,88
3580 SAVE "SHIP.BAK",8
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3 into 1 EDITOR

PROGRAM: SPRITES1.GEN

```
1000 PRINT"(CLR)(DOWN)(DOWN)
(DOWN)  THIS PROGRAM WILL PO
KE THE FIRST HALF"
1010 PRINT"  OF THE SPRITE D
ATA INTO MEMORY"
2000 FORL=0TO98:CX=0:FORD=0T
015:READA:CX=CX+A:POKE10240+
L*16+D,A:NEXTD
2010 READA:IFA<>CXTHENPRINT"
ERROR IN LINE";2040+(L*10):S
TOP
2020 NEXTL
2040 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,48,0,0,48
2050 DATA48,0,0,48,0,0,52,0,
0,32,0,0,116,0,0,52,348
2060 DATA0,0,96,0,0,116,0,0,
36,0,0,100,0,0,100,0,448
2070 DATA0,116,0,0,100,0,0,1
01,64,1,117,128,1,101,192,0,
921
2080 DATA1,105,208,1,121,208
,1,189,144,1,185,208,1,173,1
44,1,1691
2090 DATA190,144,1,190,144,5
,190,80,5,187,80,5,191,80,6,
187,1685
2100 DATA144,6,186,212,6,186
,212,6,186,212,6,187,212,5,1
86,212,2164
2110 DATA6,186,212,5,191,208
,1,123,208,0,53,64,0,16,0,0,
1273
2120 DATA0,0,0,5,85,64,25,85
,80,106,85,84,106,255,253,10
7,1340
2130 DATA255,255,107,221,175
,107,215,111,155,213,223,103
,255,255,153,255,3058
2140 DATA253,103,85,87,25,25
5,253,6,85,86,1,170,169,0,85
,84,1747
2150 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0
2160 DATA0,0,0,84,5,0,101,86
,64,105,85,144,107,213,116,1
07,1217
2170 DATA255,253,107,255,255
,107,255,255,155,255,255,103
,213,85,153,127,3088
2180 DATA255,103,213,85,25,1
06,170,6,149,85,1,64,0,0;0,0
,1262
2190 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0
2200 DATA0,0,0,85,5,80,101,7
0,84,105,86,149,107,246,189,
107,1414
2210 DATA253,191,107,253,175
,107,239,111,107,239,95,155,
223,255,103,231,2844
2220 DATA253,153,93,87,103,2
31,253,25,89,86,6,134,169,1,
65,84,1832
2230 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0
2240 DATA0,0,0,84,1,80,101,8
5,148,105,101,165,107,233,11
1,107,1428
2250 DATA235,239,107,235,239
,107,239,223,155,223,255,103
,253,255,153,247,3268
2260 DATA127,103,93,213,25,2
46,127,6,89,149,1,164,106,0,
80,21,1550
2270 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0
2280 DATA21,64,0,25,80,0,26,
84,0,26,253,0,26,255,64,90,1
014
2290 DATA255,208,102,247,244
,105,245,253,155,255,255,103
```

```
,255,255,153,245,3335
2300 DATA85,103,95,255,25,24
5,85,6,90,170,1,165,85,0,80,
0,1490
2310 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2320 DATA0,0,0,5,21,80,25,10
1,84,106,89,85,106,251,255,1
07,1315
2330 DATA251,255,107,235,239
,107,219,239,155,215,239,103
,255,223,153,255,3250
2340 DATA111,103,85,213,25,2
55,111,6,85,149,1,170,74,0,8
5,5,1478
2350 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2360 DATA0,0,0,5,85,64,25,85
,80,106,85,84,106,255,253,10
7,1340
2370 DATA255,255,107,235,239
,107,219,239,155,215,239,103
,255,223,153,255,3254
2380 DATA125,103,85,151,25,2
55,125,6,85,150,1,170,105,0,
85,20,1491
2390 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2400 DATA0,0,0,1,80,0,1,14
8,85,81,165,101,85,175,105,1
027
2410 DATA85,175,155,253,111,
103,255,223,153,95,255,103,2
45,255,25,95,2586
2420 DATA127,6,165,213,1,90,
127,0,5,149,0,0,106,0,0,21,1
010
2430 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2440 DATA0,0,0,5,69,64,25,89
,80,106,86,84,106,254,253,10
7,1328
2450 DATA255,255,107,235,175
,107,219,111,155,215,95,103,
255,255,153,253,2948
2460 DATA253,103,87,87,25,25
3,253,6,86,86,1,169,169,0,84
,84,1746
2470 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2480 DATA0,0,0,5,21,64,25,10
1,80,106,89,84,106,251,253,1
07,1292
2490 DATA239,255,107,239,175
,107,239,111,155,223,95,103,
255,255,153,255,2966
2500 DATA253,103,85,87,25,25
5,253,6,85,86,1,170,169,0,85
,84,1747
2510 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2520 DATA0,0,0,0,0,0,0,0,0,4
,0,64,29,1,208,29,335
2530 DATA85,208,29,101,208,2
5,233,144,25,233,144,5,101,6
4,4,84,1693
2540 DATA64,5,17,64,17,17,16
,17,17,16,1,17,0,1,17,0,286
2550 DATA1,17,0,0,16,0,0,16,
0,0,16,0,0,16,0,0,82
2560 DATA0,0,0,0,16,0,0,116,
0,0,125,0,0,29,0,0,286
2570 DATA86,64,17,101,0,117,
233,80,125,233,16,29,101,64,
6,84,1356
2580 DATA80,1,81,20,0,81,4,0
,68,68,0,68,64,0,4,16,555
2590 DATA0,5,16,0,1,4,0,0,4,
0,0,0,0,0,0,0,30
2600 DATA1,64,0,7,209,64,7,1
83,144,31,166,164,30,166,164
,26,1426
2610 DATA150,164,26,105,164,
5,109,148,30,109,80,26,125,1
64,26,150,1581
2620 DATA164,26,153,164,26,1
49,148,6,89,80,1,69,80,0,1,6
4,1220
2630 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2640 DATA0,84,0,1,237,0,7,16
9,80,7,169,228,7,169,169,6,1
333
2650 DATA149,169,29,105,169,
31,109,169,122,109,164,122,1
25,84,106,86,1848
2660 DATA80,106,105,144,26,1
06,80,5,105,80,0,85,64,0,21,
0,1007 -
2670 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2680 DATA0,21,0,0,122,64,5,2
34,144,29,234,144,127,106,14
4,122,1496
2690 DATA150,100,106,105,169
,122,109,165,106,109,169,106
,125,165,25,150,1981
2700 DATA149,6,169,165,6,165
,84,6,169,80,1,165,0,0,84,0,
1249
2710 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2720 DATA0,1,64,5,71,208,31,
158,164,30,154,164,122,154,1
64,122,1612
2730 DATA150,164,122,105,144
,26,109,80,5,109,164,6,125,1
69,26,150,1654
2740 DATA169,26,165,153,26,1
49,100,26,101,84,5,145,80,1,
64,0,1294
2750 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2760 DATA80,84,20,100,116,10
0,105,117,164,105,189,164,10
2,191,100,26,1763
2770 DATA255,208,27,191,208,
106,255,244,107,191,244,110,
255,244,106,171,2922
2780 DATA244,106,255,244,105
,85,244,87,255,84,30,154,208
,25,85,144,2355
2790 DATA6,154,64,1,85,0,0,0
,0,0,0,0,0,0,0,0,310
2800 DATA0,16,0,0,16,0,0,16,
0,0,100,0,0,100,0,0,248
2810 DATA100,0,0,100,0,1,169
,0,1,169,0,1,173,0,6,170,890
2820 DATA64,6,170,64,6,174,6
4,6,175,64,1,189,0,1,253,0,1
237
2830 DATA0,84,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,84
2840 DATA0,16,0,1,117,0,23,2
47,80,127,245,212,127,247,11
6,127,1685
2850 DATA245,212,127,247,116
,127,245,212,127,247,116,127
,245,212,31,247,2883
2860 DATA80,31,245,208,31,24
7,80,23,245,80,7,247,80,7,24
5,80,1936
2870 DATA23,247,80,29,245,80
,13,245,208,13,245,208,29,24
5,192,0,2102
2880 DATA13,245,192,13,245,1
92,4,116,64,0,116,0,0,116,0,
0,1316
2890 DATA116,0,0,116,0,0,48,
0,0,116,0,0,116,0,0,48,560
2900 DATA0,0,116,0,0,48,0,0,
48,0,0,48,0,0,48,0,308
2910 DATA0,48,0,0,0,0,0,0,0,
0,0,0,0,0,0,255,303
2920 DATA0,0,0,16,84,16,81,1
01,20,81,185,20,20,252,80,5,
961
2930 DATA49,64,6,86,64,2,170
,0,1,169,0,1,85,0,1,69,767
2940 DATA0,1,69,0,5,1,64,0,0
,0,0,0,0,0,0,0,140
2950 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,255,255
2960 DATA1,0,0,1,0,0,1,0,0,1
,0,0,6,64,0,6,80
2970 DATA64,0,6,64,0,6,64,0,
6,64,0,25,144,0,25,144,612
2980 DATA0,29,208,0,29,208,0
,109,228,0,125,244,0,125,244
,0,1549
2990 DATA117,116,0,22,80,0,2
5,144,0,25,144,0,4,64,0,255,
996
3000 DATA84,0,84,105,17,164,
106,118,164,106,186,164,27,1
87,144,27,1683
3010 DATA255,144,26,254,144,
38,254,96,38,186,96,38,186,9
6,45,185,2081
3020 DATA255,255,0,0,255,255
,255,255,255,0,0,255,255,255
,255,255,3060
4000 PRINT "(DOWN)(DOWN)(DOW
N)  NOW LOAD AND RUN SPRITES
.GEN2"
```

PROGRAM: SPRITES2.GEN

```
1000 PRINT "(CLR)(DOWN)(DOWN
)THIS PROGRAM WILL POKE THE
SECOND HALF"
1010 PRINT"OF THE SPRITE DAT
A INTO MEMORY"
1020 PRINT "IT WILL THEN SAV
E THE DATA ONTO DISK."
1030 PRINT "IF USING TAPE CH
ANGE THE ,8 IN THE SAVE"
1040 PRINT "INSTRUCTION TO ,
1."
2000 FORL=0TO98:CX=0:FORD=0T
O15:READA:CX=CX+A:POKE11808+
L*16+D,A:NEXTD
2010 READA:IFA<>CXTHENPRINT"
ERROR IN LINE";2040+(L*10):S
TOP
2020 NEXTL
2040 DATA224,13,185,192,13,1
85,192,12,116,192,0,116,0,1,
117,0,1558
2050 DATA1,173,0,1,125,0,1,1
05,0,0,100,0,0,16,0,0,522
2060 DATA5,64,0,6,148,20,6,1
57,105,6,173,169,6,238,169,6
,1278
2070 DATA238,228,6,190,228,6
,190,144,1,186,144,1,186,96,
13,186,2043
2080 DATA96,13,185,224,9,185
,192,1,231,128,1,231,128,6,2
08,0,1838
2090 DATA6,244,0,6,228,0,1,1
44,0,0,64,0,0,0,0,0,693
2100 DATA0,1,80,20,22,144,10
5,118,144,106,122,144,106,18
7,144,27,1470
2110 DATA187,144,27,190,144,
6,190,144,6,174,64,9,174,64,
9,174,1706
2120 DATA112,11,110,112,3,11
0,96,2,219,64,2,219,64,0,7,1
44,1275
2130 DATA0,31,144,0,27,144,0
,6,64,0,1,0,0,0,0,0,417
2140 DATA0,0,0,1,85,0,5,86,6
4,22,169,144,26,170,80,26,87
8
2150 DATA170,80,26,170,144,2
3,170,80,6,254,64,6,170,64,2
```

```
5,153,1605
2160 DATA144,26,85,144,30,69
,208,26,70,144,26,70,144,29,
1,208,1424
2170 DATA25,1,144,29,1,208,2
9,1,208,4,0,64,0,0,0,0,714
2180 DATA0,5,0,0,21,80,0,106
,80,0,106,84,1,170,148,1,802
2190 DATA170,149,1,186,149,5
,122,165,5,110,148,7,106,164
,26,90,1603
2200 DATA148,26,85,80,121,26
,64,100,26,64,212,109,0,208,
101,0,1370
2210 DATA80,116,0,64,100,0,1
,208,0,1,208,0,0,64,0,0,842
2220 DATA0,80,0,5,84,0,5,169
,0,21,169,0,22,170,64,86,875
2230 DATA170,64,86,174,64,90
,173,80,22,185,80,26,169,208
,22,165,1778
2240 DATA164,5,85,164,1,164,
109,1,164,25,0,121,23,0,89,7
,1122
2250 DATA0,29,5,0,25,1,0,7,6
4,0,7,64,0,1,0,0,203
2260 DATA0,20,0,1,105,64,6,2
35,144,26,170,164,30,174,180
,106,1425
2270 DATA234,169,122,170,173
,106,170,233,123,170,173,107
,170,169,123,234,2646
2280 DATA173,107,234,233,122
,255,173,106,255,169,30,190,
180,26,170,164,2587
2290 DATA6,235,144,5,105,80,
7,85,208,7,65,208,7,65,208,0
,1435
2300 DATA0,20,0,1,105,64,6,2
35,144,26,170,164,30,174,180
,106,1425
2310 DATA234,169,122,234,173
,107,234,233,123,170,173,107
,170,169,123,170,2711
2320 DATA237,107,234,169,122
,234,173,106,251,169,30,190,
180,26,170,164,2562
2330 DATA118,235,144,181,105
,64,208,116,0,65,180,0,1,208
,0,0,1625
2340 DATA0,20,0,1,105,64,6,2
35,144,26,170,164,30,174,180
,106,1425
2350 DATA234,169,122,170,173
,106,170,169,123,170,237,106
,170,233,122,170,2644
2360 DATA237,107,171,233,122
,235,173,106,255,169,30,190,
180,26,170,164,2568
2370 DATA6,235,157,1,105,94,
0,29,7,0,30,65,0,7,64,0,800
2380 DATA0.16.0.0.16.0.0.16,
0,0,16,0,1,17,0,1,83
2390 DATA17,0,1,17,0,17,17,1
6,17,17,16,5,17,64,4,84,309
2400 DATA64,5,101,64,25,233,
144,25,233,144,29,101,208,29
,85,208,1698
2410 DATA29,1,208,4,0,64,0,0
,0,0,0,0,0,0,0,0,306
2420 DATA0,0,0,0,0,0,0,4,0
,1,4,0,5,16,0,30
2430 DATA4,16,0,68,64,0,68,6
8,0,81,4,1,81,20,6,84,565
2440 DATA80,29,101,64,125,23
3,16,117,233,80,17,101,0,0,8
6,64,1346
2450 DATA0,29,0,0,125,0,0,11
6,0,0,16,0,0,0,0,0,286
2460 DATA0,0,0,0,0,64,0,0,
65,0,0,17,64,0,16,226
2470 DATA64,0,4,68,0,68,68,0
,65,20,0,81,21,0,20,86,565
2480 DATA64,5,101,208,17,233
,244,21,233,116,1,101,16,6,8
4,0,1450
2490 DATA1,208,0,1,244,0,0,1
16,0,0,16,0,0,0,0,0,586
2500 DATA0,21,0,1,102,64,5,1
53,144,26,166,100,26,170,148
,107,1233
2510 DATA170,165,106,170,233
,122,170,169,106,170,173,123
,170,169,110,170,2496
2520 DATA249,123,175,93,126,
251,93,127,175,121,126,250,2
37,31,254,180,2611
2530 DATA30,251,244,7,255,20
8,1,125,64,0,20,0,0,0,0,0,12
05
2540 DATA1,16,64,6,117,144,5
,182,80,30,182,180,103,170,2
08,85,1573
2550 DATA170,85,233,186,102,
126,190,169,86,150,189,102,1
50,85,169,154,2346
2560 DATA89,109,170,102,117,
170,169,150,94,121,106,94,93
,26,158,148,1916
2570 DATA123,110,164,107,106
,164,29,106,116,29,117,144,4
,16,64,0,1399
2580 DATA0,0,0,0,0,0,0,0,0
,20,0,1,85,64,5,175
2590 DATA235,80,31,170,244,1
27,150,253,31,170,244,5,235,
80,1,85,2141
2600 DATA64,4,20,16,16,0,4,0
,0,0,0,0,0,0,0,0,124
2610 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2620 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2630 DATA0,0,0,0,0,0,0,1,8
5,64,85,85,85,1,85,491
2640 DATA64,4,0,16,16,0,4,0,
0,0,0,0,0,0,0,0,104
2650 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2660 DATA0,0,0,16,84,16,81,1
01,20,81,185,20,20,252,80,5,
961
2670 DATA49,64,6,86,64,2,170
,0,1,169,0,1,85,0,1,69,767
2680 DATA0,1,69,0,5,1,64,0,0
,0,0,0,0,0,0,0,140
2690 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2700 DATA4,0,4,25,0,25,30,68
,105,26,89,105,26,122,105,30
,764
2710 DATA186,89,26,250,89,30
,186,89,30,250,89,30,126,105
,30,122,1727
2720 DATA105,30,126,105,30,1
22,105,29,126,89,29,127,89,4
,126,68,1310
2730 DATA4,127,68,0,127,64,0
,29,0,0,25,0,0,4,0,0,448
2740 DATA3,3,0,2,66,64,0,0,0
,2,2,0,1,1,0,0,144
2750 DATA0,0,0,0,2,2,0,0,0
,0,0,0,0,0,0,4
2760 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2770 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2780 DATA3,155,0,7,139,64,10
,98,144,4,136,64,11,3,128,8,
974
2790 DATA136,128,10,2,128,3,
3,0,2,2,0,0,0,0,2,2,418
2800 DATA0,0,0,2,2,0,0,0,0
,0,0,0,0,0,0,4
2810 DATA0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2820 DATA6,70,64,27,155,144,
6,154,64,46,238,224,24,136,1
44,46,1548
2830 DATA2,224,8,136,128,2,7
4,64,10,6,128,7,139,0,10,2,9
40
2840 DATA128,8,136,128,10,2,
128,3,3,0,2,2,0,0,0,0,550
2850 DATA2,2,0,0,0,0,0,0,2
,2,0,0,0,0,0,8
2860 DATA0,16,0,0,100,0,1,10
5,0,1,125,0,1,173,0,1,523
2870 DATA116,0,0,116,0,12,11
6,192,13,185,192,13,185,192,
45,185,1562
2880 DATA224,38,186,96,38,18
6,96,38,254,96,26,254,144,27
,255,144,2102
2890 DATA27,187,144,106,186,
164,106,118,164,105,17,164,8
4,0,84,0,1656
2900 DATA0,0,0,0,64,0,1,144,
0,6,228,0,6,244,0,6,699
2910 DATA208,0,1,231,128,1,2
31,128,9,185,192,13,185,224,
13,186,1935
2920 DATA96,1,186,96,1,186,1
44,6,190,144,6,190,228,6,238
,228,1946
2930 DATA6,238,169,6,173,169
,6,157,105,6,148,20,5,64,0,0
,1272
2940 DATA0,0,0,1,0,0,6,64,
0,27,144,0,26,208,0,476
2950 DATA7,144,2,219,64,2,21
9,64,11,110,96,11,110,112,9,
174,1354
2960 DATA112,9,174,64,6,174,
64,6,190,144,27,190,144,27,1
87,144,1662
2970 DATA106,187,144,106,122
,144,105,118,144,20,22,144,0
,1,80,6,1449
2980 DATA0,0,0,4,0,64,29,1,2
08,29,1,208,25,1,144,29,743
2990 DATA1,208,26,70,144,26,
70,144,30,69,208,26,85,144,2
5,153,1429
3000 DATA144,6,170,64,6,254,
64,23,170,80,26,170,144,26,1
70,80,1597
3010 DATA26,170,80,22,169,14
4,5,86,64,1,85,0,0,0,0,48,90
0
3020 DATA255,255,0,0,255,255
,255,255,255,0,0,255,255,255
,255,255,3060
4000 REM ** READY TO SAVE **
4010 PRINT"(CLR)(DOWN)(DOWN)
  ANY KEY TO SAVE"
4020 GETK$:IFK$=""THEN4020
4030 POKE 43,0:POKE44,40:POK
E45,64:POKE446,52
4040 SAVE "SPRITES",8
```

3 into 1 EDITOR

ASSEM

Steve Carrie brings you an Assembler for your C128.

EVERYONE WHO IS USING their computer seriously, as opposed to merely playing with it, needs an Editor/ Assembler.

In *Your Commodore*, July '86, we printed the Editor This is the second and final part – the Assembler.

The Assembler

The assembler is called by the C command to operate on source text in RAM 1. A range of directives allow space reservation, byte, word and text insertion. Symbols may be up to 128 characters in length and post-assembly messages detail memory useage and any relevant relocation data.

Several subcommands are available in the C command.

S – list symbol table at end of assembly.
L – list program at end of assembly.
A – assemble to memory.
These are in any order after the C.
CLSA – assemble, list prog & syn.
CA – assemble.
C – compile only, no code sent to memory,
CL – compile and list only.

Assembly begins at the first line and continues until either the end of text or the] directive is found. Symbols up to 127 chars. in length may contain the following characters; a-z, 0-9, &, ,%,$ and -.

The assembler translates all uppercase chars. to lowercase except in the T: directive.

Summary of Operators

$	hexadecimal
%	binary
>	high byte
<	low byte
#	immediate
+	plus
-	minus

Directives

Directive	Example	Function
*=	*=$1000	set assembly address
# L:	#L:$5000	set relocation address (see below)
# B:	# B:0,1,2	insert byte data
# W:	# W:$1000	insert word data
# R:	# r:40	reserves a specified number of bytes
# T:	# T:asem	insert ASCII data
# M:	# M:0	sets assembly bank
.	.border	define symbol
]	]	end or prog. (not req.)
;	;comment	insert comments in text

Entering the Assembler Code

Again, the program is given here as hex data strings. Use the LOADER Program from *Your Commodore*, July '86 (remember to run RELOCATE first).

Before you begin to enter the assembler code, first load the current work file which should contain the code you typed in last time i.e. the working editor code. For the first start address, enter 3041.

Summary of Directives

*=	code assembly location
# L:	code relocation address
# B:	byte
# W:	word
# R:	reserve
# T:	Text
# M:	memory bank
]	end of code
.	symbol declare
;	comment

Operators

1. $ declares following number in hex. format
2. % number in binary format
3. < load low-order byte of 16-bit quantity
4. > load high-order byte of 16-bit quantity
5. # standard 6502 immediate
6. + value of expression is increased
7. - value of expression is decreased

Note: decimal numbers have no prefix

Examples of above:

1. lda $01
2. ldx # %11110011
3. lda#<yc
4. ldy# > yc
5. lda # $00
6. sta buffer+1
7. lda buffer-2

The relocation works like this. Suppose you want to assemble to an address that is occupied by another program (this assembler for example). If you went ahead, you would likely crash the system or corrupt the program. The L: directive allows you to place the code elsewhere, but assemble it to run at the required address. For example:

*=$3000
L:$9000

This causes the code to be placed at 9000 hex, but it will be assembled to run at 3000 hex i.e. all JMP and JSR calls will be assembled correctly. After assembly, the monitor commands may be used to save the program and/or relocate it to the run address.

At the end of assembly, 2 sets of addresses are printed. For example:

ASSEMBLY COMPLETE
ADDRESSES ARE >
(ASSEMBLY) $3000,$3175
(LOCATION) $9000,$9175

This shows that the code has an assembly address of $3000 hex but actually resides at 9000 hex. If no relocation was required, the addresses will be the same.

BLER128

If an error occurs, assembly stops and the error type is printed along with the line number in which the error occurred. Assembly may be stopped at any time by the RUN/STOP key.

Bits and Pieces

The symbol table occupies about 16K in RAM 0 following the program. Therefore, if you want to assemble code in RAM 0 in the area IC00-7FFF hex, relocate it elsewhere. The assembler also uses the areas 0E00-0EFF, 0C00-0CFF, 0D00-0DFF.

Try to keep symbols short as meaningful as possible. At an average of 10 chars. per symbol, about 1500 symbols may be accommodated. This falls to 750 with an average of 20. These figures are, of course, average and will vary considerably.

I hope some of you find this program useful. If you have any comments/complaints/suggestions please write to me at the *Your Commodore* office.

Possible Error Messages

Illegal memory bank	– only 0-15 valid in M:
Bad operation	– not a valid mnemonic.
Too many symbols	– symbols table full.
Symbol redefined	– symbol declared twice.
Bad addressing mode	– not valid mode for mnemonic.
Undef'd symbol	– symbol not declared.
Branch range	– relative branch error.
Symbol syntax	– illegal character.
Bad directive	– problem with directive.
Bad operand	– problem with operand.
Syntax	– overall syntax error.
Illegal quantity	– number out of range.

PROGRAM: ASM-HEXDATA

```
3041 4CA93AFF696575FF6D7D796171FFFF292535FF2D3D392131FF0AFF0616FF0E1E 0E69
3061 FFFFFFFFFFFF24FFFF2CFFFFFFFFFFFFC9C5D5FFCDDDD9C1D1FFFFE0E4FFFFEC 1C65
3081 FFFFFFFFFFFFC0C4FFFFCCFFFFFFFFFFFFFFC6D6FFCEDEFFFFFFFFFF494555FF 1C65
30A1 4D5D594151FFFFFFE6F6FFEEFEFFFFFFFFFFFFFFFFFFFF4CFFFFFFFF6CFFFFFFFF 1B00
30C1 FF20FFFFFFFFFFFFA9A5B5FFADBDB9A1B1FFFFA2A6FFB6AEFFBEFFFFFFFFFFA0A4 1A36
30E1 B4FFACBCFFFFFFFF4AFF4656FF4E5EFFFFFFFFFFFF090515FF0D1D190111FF2AFF 1341
3101 2636FF2E3EFFFFFFFFF6AFF6676FF6E7EFFFFFFFFFFFE9E5F5FFEDFDF9E1F1FFFF 1963
3121 FF8595FF8D9D998191FFFFFF86FF968EFFFFFFFFFFFFFFFF8494FF8CFFFFFFFFFF 1A2A
3141 42434390424353B0424551F0424D4930424E45D042504C10425643504256537O 0AC9
3161 434C4318434C44D8434C4958434C56B8444558CA44455988494E58E8494E59C8 0C06
3181 504841485048500850 4C4168504C50285254494052545360534543385344 4F8 09D9
31A1 5345497854 4158AA544159A8545358BA5458418A5458539A545941984E4F50EA 0CAC
31C1 42524B0041444300414E440B41534C1642495421434D502C4350583743505942 07D7
31E1 4445434D454F5258494E43634A4D506E4A5352794C4441844C44588F4C44599A 0AA0
3201 4C5352A54F5241B0524F4CBB524F52C6534243D1535441DC535458E7535459F2 0DCE
3221 C63EFF7F0000000000000000000000000000000000000000000000494C4C4547 03EF
3241 414C204D454D4F52592042414E4B00424144204F5045524154494F4E00544F4F 084C
3261 204D414E592053594D424F4C530053594D424F4C205245444546494E45440042 085C
3281 41442041444452455353494E47204D4F444500554E444546274420 53594D424F 0855
32A1 4C004252414E43482052414E47450053594D424F4C2053594E5441580042 4144 082B
32C1 20444952454354495645004241442 04F504552414E440053594E54415800494C 082B
32E1 4C4547414C205155414E5449545900554E444546274420 4C494E45003C325032 0819
3301 5E326F3280329432A332B032BE32CC32D832DF32F032204552524F5220494E20 0C0C
3321 001027E80364000A00415353454D424C4552205255 4E4E494E470D0050415353 07B3
3341 20310D0050415353320320D00415353454D424C5920434F4D504C4554450D4144 075F
3361 4452455353455320415245203E28415353454D424C592920000D2E2020202020 071B
3381 202020202020202020284C4F434154494F4E292000415353454D424C45592053 0702
33A1 544F505045440D00A20A2CA20B2CA20C8A0AAABDFD32BCFE32203735A917A033 0B6D
```

```
33C1 203735A541A44220993D20E43D4CBE3EE63DD002E63EA00078A201A93D20D0F7 0D78
33E1 58297FC920F0E96078A201A93D20D0F7586078A201A93D20D0F758297F607848 0ECA
3401 A9FB8DB90268AE3232F006AE283220DAF7586078A20148A93D8DC8026820E3F7 0F0F
3421 5860C9309012C947B00EC93AB003290F60C9419003E937604CAC3320D7332023 0C24
3441 340A0A0A0A8D2A3220D1332023340D2A328D2A324CD133203C34AD2A328516A9 085F
3461 00851720D733207A34B00160203C34A5168517AD2A32851660208C34900160C9 0A2A
3481 419006C947B00238601860C93090FAC93AB0F6386020B5349001604C8C342096 0D29
34A1 34900160C9239006C926B0023860C92DF0FA1860C9419005E95B38E9A56020D7 0E38
34C1 33A2008E2A32C930F007C931F0034CAC33290F0D2A328D2A3220D133E8E008D0 0C15
34E1 01600E2A324CC734A53D38E901853DA53EE900853EA900851685172OD133C930 0B64
3501 9033C93AB02F48A51748A516480616261706162617681865168516686517851 7 08BC
3521 0616261768290F1865168516A517690085174CFC34608549844AA000B149F006 09F0
3541 20D2FFC8D0F660A547A648853B863CA9008D3A328D3B328D38328D393285FD85 0ECD
3561 FE85FB85FC8D333260A94DA033203735AD2532AC263220E93DA92C20D2FFA5FD 0F5C
3581 A4FE20E93DA97AA033203735AD3432AC353220E93DA92C20D2FFA5FBA4FC20E9 0FE5
35A1 3D20E43D60A9292CA9282CA92CA000201434D0034CD1334CA933A00020E93385 0B62
35C1 43C820E933C900D00238608544C820E9338541C820E9338542AD2732C902D019 0D92
35E1 AD3632F014A200C88E2E3220E933AE2E329D000CE8C900D0EEA0031860A543A6 0D7C
3601 44853D863E20BB35B00EC89818653D853DA53E6900853E1860A53BA63C4C0236 0B41
3621 AD2132AE223285828683A000C54BD008E44CD004A2001860B182AACD000ED017 0D57
3641 AAE88E2E32C8B9000ED182D00BC8CC2E32D0F3A2003860E8E8E88A1865828582 1076
3661 A58369008583AAA5824C2B3620B534B005A2074CB133A00020F333209F34900B 0C22
3681 99010EC8C080D0F04C72368C000E1898653D853DA53E6900853E60202136B003 0BAB
36A1 A20560AC000EC8B1828584C8B182858520D733C92BF007C92DF0034CE7364820 0E99
36C1 D13320F63668C92BD00E18A51665848516A51765858517 60A58438E5168516A5 0D1F
36E1 85E517851760A5848516A58585176020F6364CB33C20D733C924D00820D13320 0D21
3701 58343860C925D01120D13320BF34A9008517AD2A3285163860C93CF004C93ED0 0C7B
3721 164820D13320F63668C93CF004A5178516A90085173860208C34900520E93438 0B4D
3741 60C927D00E20D1338516A900851720D133386020B534B0034CA933206D36209C 0B51
3761 36E005F0023860AD2732C901D0021860A2054CB13320D133A93D20AE3520F636 0BEF
3781 A516A61785FD8D253286FE8E2632AC3332F0016085FB8D343286FC8E35326020 0E14
37A1 D133C93AF0034CA93320D133A00020E933C93AF018C900F014AE2732E002D003 0DB6
37C1 20FF33C8C046D0E6A2084CB133189865FD85FDA5FE690085FE189865FB85FBA5 1208
37E1 FC690085FC6020D133C957D0034C3238C942F0034C793820D133A93A20AE3520 0D38
3801 F636A517F0034CAC33AE2732E002D007A000A51620FF33E6FDD002E6FEE6FBD0 10BD
3821 02E6FC20D733C92CD00620D1334C00386020D133A93A20AE3520F636AE2732E0 0D1E
3841 02D00DA000A51620FF33C8A51720FF33A5FD18690285FDA5FE690085FEA5FB18 0F50
3861 690285FBA5FC690085FC20D733C92CD00620D1334C3A3860C954D0034CA037C9 0E89
3881 52D02820D133C93AD06A20D13320F63618A5FD651685FDA5FE651785FEA5FB18 102C
38A1 651685FBA5FC651785FC60C94DD02020D133C93AD03E20D13320F636A517D00A 0F3A
38C1 A516C910B0048D283260A2004CB133C94CD02120D133C93AD01A20D13320F636 0CE8
38E1 A9018D3332A516A61785FB8D343286FC8E3532604CA933AD2732C901F0076020 0CCD
3901 713D4C0C3620D133206D3620D733C900F011C920F00DC93AF009C93DF005A207 0C9D
3921 4CB13320213608AE000EE88E2E32289005A2034CB133AE2E32E8E88A18654B85 0B88
3941 86A54C69008587CD2432900B8ACD23329005A2024CB133A000B9000E914BC8CC 0C96
3961 2E32D0F520D733AC2E32C93DF016EAEAEAEAA5FD914BC8A5FE914BA586854BA5 1274
3981 87854C60984820D13320F63668A8A516914BC8A517914B4C7C3985848685 8C2D 0DDD
39A1 32A200A000B9010ED184D00CC8C003D0F4B1848D29323860E8EC2D32D0021860 0DEE
39C1 18A90465848584A585690085854CA439206D36AD000EC903F005A2014CB133A9 0C38
39E1 41A231A008209B399003A90160A961A231A019209B399003A90260A9C5A231A0 0C56
3A01 17209B399003A903604CDB39B188C9FFF0038D293260A2044CB13320E1FFD006 0DF2
3A21 A9FF8D273260A5FDA6FE8D38328E3932A5FBA6FC8D3A328E3B3220D733C92AD0 1047
3A41 062076374C753AC95DD00160C93BD0034C753AC92ED00620F8384C753AC923D0 0CCB
3A61 0620E7374C753A20B534B005A2014CB133208A3B20003920D733C900F007C93A 0AFB
3A81 F01A4CA933AD2732C902D008AD3632F00320233E20FE35B0094C1C3A20D1334C 0B82
3AA1 1C3A60A9204CD2FF20443B204835A92AA033203735A9008D3332A9018D2732A9 0ADE
3AC1 0C8D2832A53B8D3032A53C8D3132AD2132AE2232854B864C201A36A93DA03320 0A80
3AE1 3735201C3AEE2732F02DAD3032853BAD3132853C205035201A36A945A0332037 0A13
3B01 35201C3AEE2732F00EAD3732F003204C3E206A354CBE3EA996A0332037354CBE 0B52
3B21 3E4E4F54204120434F52524543542043 4F4D50494C4520535542434F4D4D414E 08B0
```

```
3B41 440D00A9008D32328D37328D3632A000C8B9000EC920F0F8C943F0F4C900D001 0D60
3B61 60C941D006EE32324C513BC953D006EE37324C513BC94CD006EE36324C513BA9 0D4D
3B81 22A03B2037354CBE3E20D139C902D005A9014CA33BC901D00620E83B4CA33B20 0B9C
3BA1 453C8D2E32AE2732E002D01EA000AD293220FF33C8CC2E32F010A51620FF33C8 0D08
3BC1 CC2E32F005A51720FF3318AD2E3265FD85FDA5FE690085FEAD2E321865FB85FB 0FCC
3BE1 A5FC690085FC60AD2732C902F003A90260AD29328D2B32A92020AE3520F636A5 0D69
3C01 17D0034C333CA5FD1869028584A5FE69008585A51638E5848516A517E585F009 0DFF
3C21 C9FFF017A2064CB133A516C98090034C253CAD2B328D2932A90260A516C98090 0D7C
3C41 E34C333CAD29328D2F321869448588A93069008589A92020AE35C941D015A001 0C12
3C61 20F333209F34B00B20D133A000200D3AA90160C923D01720D13320F636900CA5 0BAD
3C81 17F0034CAC33A001200D3AA90260C928D0034C223DAD2732C902F00EAD2F32C9 0B5D
3CA1 79F004C96ED003A9036020F636B003A90360A517D03F20D733C92CF01BAD2F32 0D91
3CC1 C96EF004C979D008A005200D3AA90360A002200D3AA9026020AC35C958F007C9 0C53
3CE1 59F0074CA933A003D002A004200D3A20D133A9026020D733C92CF008A005200D 0B10
3D01 3AA9036020AC35C958F007C959F0074CA933A006D002A007200D3A20D133A903 0BF6
3D21 6020D13320F63620D733C92CF02620A635C92CF008A00A200D3AA9036020AC35 0C0B
3D41 A95920AE35A517F0034CAC33A009200D3AA9026020AC35A95820AE35A92920AE 0B9F
3D61 35A517F0034CAC33A008200D3AA90260A23A8E2D32A0008C2E32AD2E32AE2D32 0A98
3D81 8D2D328E2E3220E933F00CCD2E32F007C8C922D0F1F0E3608549844AA0008C29 0ECE
3DA1 32A200A54938F922338549A54AC8F922339007854AE8884CA43D88A549792233 0D62
3DC1 85498AD0072C29323007100AA2808E2932093020D2FFC8C8C00890C5A5490930 0C10
3DE1 4CD2FFA90D4CD2FF8D29329848A92420D2FF6820FD3DAD29324CFD3D20083E8A 0EB6
3E01 20D2FF984CD2FF484A4A4A4A20193EAA68290F20193EA860C90A900369366009 0BC4
3E21 3060AD3A32AC3B3220E93D20A43AAD3832AC393220E93D20A43AA000B9000CF0 0BCD
3E41 0620D2FFC8D0F520E43D60A9A5A03E203735AD2132AE22328582868 3A582C54B 0F26
3E61 D00AA583C54CD00420E43D60A000B182A8C88C2A32B182AAC8B182A88A20E93D 1003
3E81 20A43AA001B18220D2FFC8CC2A3290F520E43DC8C8189865828582A583690085 0FBD
3EA1 834C5D3E0D5441424C45204F462053594D424F4C5320555345440D0D00A9068D 0884
3EC1 00FF4C161C000000000000000000000000000000000000000000000000000000 017D
```

Bits and pieces from Allen Webb to improve your control of you 64's graphics capabilities.

TOP DRAW

TOP DRAW

IN THIS ARTICLE I WILL BE describing two routines which will hopefully be of value to you.

The first is an editor to improve your handling of scrolling backdrops. You may recall that a routine published in an earlier issue of Your Commodore allows you to display a portion of a backdrop stored behind the Basic ROM on the screen (March 1986 issue). Whilst I provided a demonstration program, I did suggest that a proper editor was necessary. As part of my sundry dabblings, I have written such an editor — it is listed in Listing 1. Before you use the editor you must load the code given in the earlier article.

The routine assumes that the backdrop occupies the area $A000 to $BFFF leaving the area between the ROMs free for code, character designs etc. The backdrop is assumed to be 80 characters wide and 100 characters high and can be considered to be eight screen sized pages. You will note that line 80 sets up the variable CP. This is the value put in location 53272 to decide which characters are shown in the backdrop. The default value of 21 gives the normal character set. The program changes back to normal characters for the menu. The system automatically sets multicolour mode.

The menu offers nine options. You can return to the menu at any time by pressing F1. Option one allows you to scan each page in turn. The pages are arranged as shown in Figure 1 and are displayed by pressing the appropriate number key.

This option allows rapid checking of the design. If you

1	2
3	4
5	6
7	8

want to scroll through the backdrop, use option two. The cursor keys control the scrolling.

Option three allows you to edit a screen. Once you've selected the option, press the number of the page you wish to edit. To add characters, place the cursor at the required position using the cursor keys and press the key corresponding to the character selected. The current character is shown as a flashing multicoloured square. This ensures visibility over any background colour. The character will be entered in the colour shown by the screen border. This can be changed by pressing F7. To move on to a new page press F6 followed by the number of the new page. When you enter a character, the colour table is updated and all other occurences of the same character will turn to that colour. The reverse on and off keys act as normal, to allow use of reverse field characters. Similarly, the HOME key acts as expected. The F3 and F5 keys are used to change the background colour for the edit and scan modes.

Option four clears the backdrop by filling the area behind the Basic ROM with character 32. The colour table is set so that all characters are white.

Options five and six allow you to SAVE and LOAD the backdrop and colour table from a device decided by option seven. On startup, the device is set to eight.

To help matters, the backdrop and colour table are saved as a single block. To load them into your own program, simply use the following line at the start of your program:

```
10 A=A+1: IF A=1 THEN LOAD
"Filename",8,1
```

Replace the eight with one if you use a cassette.

Options eight and nine allow you to see what the backdrop looks like in a smaller window. Option eight sets the size and position of the window and must be used before you try to use option nine.

The last option is for disk users only. If you want to omit it, simply leave out lines 300 and 330.

Everyone seems to have gone made over the use of icons in games and other programs. In essence, the use of icons is fairly simple. You simply have to check the co-ordinates of the pointer when a key is pressed and perform the relevant command. The second routine is a simple control program allowing you to drive a pointer icon with a joystick in port 2.

On activation you will see a flashing hand on the screen. This can be moved and its position read from a register.

The commands are simple:

SYS 52000 turns on the pointer.
SYS 52003 turns the pointer off.
SYS 52006 resets the pointer to the default design.

The code contains the design for a hand. On activation, this is copied down to sprite position 13 in the cassette buffer (832-894). The routine is locked into the IRQ interrupt and will continue to run whether or not a program is running. The position of the pointer is returned as follows:

X position — 980 least significant byte, 981 most significant byte
Y position — 982
Fire button — 984 16=button not pressed, 0=button pressed
So to calculate the X position use:

XP = PEEK(981)*256+PEEK(980) + X Offset

and

YP = PEEK (982)+ Y Offset

Offset is the difference between the end of the pointer and the top left hand corner of the sprite. In the case of the hand given here:
Y offset = 0
X offset = 24

The pointer colour cycles through all the available colours so that it is visible over any background colour.

PROGRAM: BACKDROP EDITOR

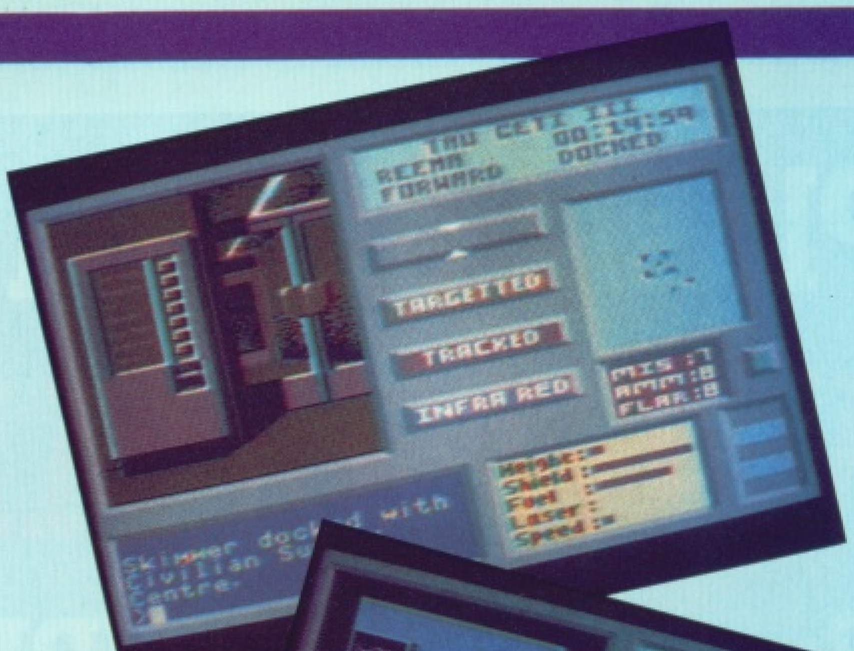
```
10 REM*****************
20 REM* BACKDROP EDITOR *
30 REM*[SPC5]AEW 1985[SPC4]*
40 REM*****************
50 IF FL=1 THEN 190
60 POKE 650,128
70 POKE 55,0:POKE 56,40:CLR
80 POKE 53272,(PEEK(53272)AND 240)OR
   10
90 POKE 53281,BC:CT=40489:BC=0
100 FOR I=1 TO 8: READ XP(I),YP(I)
   :NEXT
110 DATA 0,0,40,0,0,25,40,25,0,50,40,
   50,0,75,40,75
120 DEF FNA(X)=40960+Y*80+X
130 DEF FNB(XS)=1024+YS*40+XS
140 POKE 53282,4:POKE 53283,1
150 DATA 32,212,225,32,253,174,32,138
   173,32,247,183,165,20,72,165,21,72
   32,253
160 DATA 174,32,138,173,32,247,183,
   165,1,41,254,133,1,166,20,164,21,
   104,133,21
170 DATA 104,133,20,169,20,32,95,225,
   165,1,9,1,133,1,96
180 FOR I=52992 TO 53046:READ X
   :POKE I,X:NEXT:CC=12:DE=8
190 PRINT CHR$(147);:PRINT TAB(12)"
   [WHITE]BACKDROP EDITOR[DOWN3]"
200 POKE 53280,14:POKE 53281,0
   :PRINT TAB(13)"1. VIEW PAGES"
210 PRINT TAB(13)"2. SCAN PAGES"
220 PRINT TAB(13)"3. EDIT PAGES"
230 PRINT TAB(13)"4. CLEAR[SPC5]"
240 PRINT TAB(13)"5. LOAD[SPC6]"
250 PRINT TAB(13)"6. SAVE[SPC6]"
260 PRINT TAB(13)"7. DEVICE[SPC4]"
270 SYS 40192,40,25,80,0,0:X=0:Y=0
280 GET I$:IF I$<"1"OR I$>"8"THEN 280
285 POKE 53281,BC
290 ON VAL(I$)GOTO 300,350,430,690,
   650,730,770
300 POKE 53280,3
310 GET I$:IF I$=""THEN 310
320 IF I$="[F1]"THEN 190
330 IF I$<"1"OR I$>"8"THEN 310
340 I=VAL(I$):SYS 40195,XP(I),YP(I)
   :GOTO 300
350 POKE 53280,4: X=0:Y=0
   :SYS 40195,X,Y
360 GET I$:IF I$=""THEN 360
370 IF I$="[RIGHT]"THEN X=X+1
380 IF I$="[LEFT]"AND X>0 THEN X=X-1
390 IF I$="[UP]"AND Y>0 THEN Y=Y-1
400 IF I$="[DOWN]"THEN Y=Y+1
410 IF I$="[F1]"THEN 190
420 SYS 40195,X,Y:GOTO 360
430 GET I$:IF I$<"0"OR I$>"8"THEN 430
440 POKE 53280,CC
450 PN=VAL(I$):SYS 40195,XP(PN),YP(PN)
460 X=0:Y=0:XS=0:YS=0
470 SYS 40195,XP(PN),YP(PN)
   :ZZ=PEEK(FNB(XS))
490 GET I$:IF I$<>""THEN 500
492 POKE FNB(XS)+54272,RND(1)*16
   :POKE FNB(XS),160
494 POKE FNB(XS),ZZ:GOTO 490
500 IF I$="[RIGHT]"AND XS<39 THEN XS=
   XS+1:GOTO 470
510 IF I$="[LEFT]"AND XS>0 THEN XS=XS
   -1:GOTO 470
520 IF I$="[UP]"AND YS>0 THEN YS=YS-1
   :GOTO 470
530 IF I$="[DOWN]"AND YS<24 THEN YS=Y
   S+1:GOTO 470
540 IF I$="[F1]"THEN 190
545 IF I$="[HOME]"THEN XS=0:YS=0
   :GOTO 470
546 IF I$="[RVSON]" THEN RF=1:GOTO 490
547 IF I$="[RVSOFF]" THEN RF=0
   :GOTO 490
550 IF I$="[F7]"THEN CC=CC+1
   :POKE 53280,CC:I$="":GOTO 490
551 IF I$="[F3]"THEN BC=BC+1
   :POKE 53281,BC:I$="":GOTO 490
555 A=ASC(I$): IF A<32 OR A>127 THEN
   490
590 I=ASC(I$):GOSUB 610:ZZ=C
   :IF RF=1 THEN ZZ=ZZ+128
595 POKE FNB(XS),ZZ:X=XS+XP(PN)
   :Y=YS+YP(PN)
600 POKE FNA(X),ZZ:POKE CT+ZZ,CC
   :SYS 40195,XP(PN),YP(PN):GOTO 470
610 F=((I>31)AND(I<64))*1+((I>63)AND(
   I<97))*64+((I>191)AND(I<224))*128
620 F=F+((I>159)AND(I<192))*64+(I=255
   )*161
630 IF F=-1 THEN C=I:RETURN
640 C=I+F:RETURN
650 FL=1
660 PRINT CHR$(147)"LOAD FILE[DOWN]"
670 INPUT"FILENAME";FI$
680 LOAD FI$,DE,1
690 POKE 53280,1:FOR I=40960 TO 49151
700 POKE I,32:NEXT
710 FOR I=0 TO 255:POKE 40489+I,1:NEXT
720 GOTO 190
730 PRINT CHR$(147)"SAVE FILE[DOWN]"
740 INPUT"FILE NAME";FI$
750 SYS 52992 FI$,DE,2,40489,49151
760 GOTO 190
770 PRINT CHR$(147)"CHANGE DEVICE
   [DOWN]"
780 INPUT"DEVICE 1..CASSETTE[SPC2]
   8..DISK";DE
790 GOTO 190
```

PROGRAM: ICON DRIVER

```
1 DATA 76,62,203,76,41,203,76,78,203,
  120,169,49,141,20,3,169,234,141,21,
  3,88
2 DATA 173,21,208,41,254,141,21,208,
  96,32,78,203,120,169,203,141,20,3,
  169,203
3 DATA 141,21,3,88,96,160,0,185,138,
  203,153,64,3,200,24,192,63,144,244,
  173
4 DATA 21,208,9,1,141,21,208,169,13,
  141,248,7,169,100,141,212,3,141,
  214,3,141
5 DATA 0,208,141,1,208,169,0,141,213,
  3,173,16,208,41,254,141,16,208,169,
  1,141
6 DATA 39,208,96,0,0,6,0,0,14,0,0,28,
  0,0,56,0,0,112,0,0,224,0,113,192,0,
  59
7 DATA 192,0,31,224,0,31,240,0,31,248,
  0,63,252,0,127,252,0,255,252,1,255,
  248
8 DATA 0,255,240,0,127,224,0,63,0,0,
  30,0,0,12,0,0,0,0,0,0,238,39,208,
  173,39
9 DATA 208,41,15,141,39,208,173,0,220,
  41,31,141,215,3,201,31,240,100,74,
  176
10 DATA 3,206,214,3,74,176,3,238,214,
  3,74,176,19,72,56,173,212,3,233,1,
  141
11 DATA 212,3,173,213,3,233,0,141,213,
  3,104,74,176,19,72,24,173,212,3,
  105,1
12 DATA 141,212,3,173,213,3,105,0,141,
  213,3,104,173,215,3,41,16,141,216,
  3,173
13 DATA 212,3,141,0,208,173,214,3,141,
  1,208,173,213,3,208,11,173,16,208,
  41
14 DATA 254,141,16,208,76,70,204,173,
  16,208,9,1,141,16,208,76,49,234
20 REM
21 FOR I = 52000 TO 52296
22 READ X: T=T+X: POKE I,X: NEXT I
23 IF T<>30726 THEN PRINT"ERROR IN
  DATA"
24 REM*****************
25 REM*[SPC2]ICON DRIVER[SPC2]*
26 REM*[SPC4]AEW 1985[SPC3]*
27 REM*****************
```

Game of the Month

Stuart Cooke finds himself under attack with CRL's latest release TAU CETI.







TAU CETI HAS BECOME A PLANET OF runaway robots, it is totally devoid of human life and the planet's automated defence systems prevent anyone from going home.

In their infinite wisdom the powers that be have decided to send in an armed ground-skimmer to shut down the planet's fusion reactor which is in the capital city, Centralis, this means that the defence systems would stop working and minimal damage should occur to the buildings on the planet.

Of course before they can send the skimmer to the planet they must find a pilot stupid enough to take on this mission. Guess who volunteers, yes you've guessed it, you.

The game starts with a view of your skimmer's control panel, with your docked with your landing ship.

The skimmer operates in two modes landed mode and flying mode. When in a building or resting on the ground you are considered to be landed and can use your on board computer to examine maps of the city, or, if docked with the correct type of building, re stock your ship with essential supplies such as fuel and missiles.

Once you launch from the landing ship, you're on your own. Your job is to dock with buildings scattered around the various cities and collect cooling rods which will eventually allow you to shut down the reactor. Oh! don't forget that whenever you are flying around in any of the cities the defence systems are out to get you.

Travel between the planet's cities is made possible by a series of jump pads which are present in the cities. All jump pads will take you from one city to another. You can see where any particular jump pad leads by landing and going into map mode, which will display a map of the planet. Then, ask for info on a specific city. The picture of the map will zoom into the city that you require showing you its position and the names of the cities around it. You will then be given specific details about the city, such as how heavily it is defended and where each of its jump pads lead.

On your travels around the planet you will come across the following types of building. The reactor itself, the substations in each of the cities, civilian supply centres, military supply centres, fortresses and control towers. Docking is possible with many of the buildings so that you can go inside and use the LOOK command to see if there are any objects around, but I wouldn't suggest going too close to the Fortresses or the Control Towers as they are sure to start shooting at you.

Control of your ship is extremely easy, even though there are 17 different keys. At any one time you will probably only use speed-up, slow-down, left, right and fire and all of these are available from your joystick. Other keys are quite easily found as you simply press F for flare, L for land, M for missile etc. If you don't like the keys you can always re-define them when landed.

Your view of the planet's is through a small viewing window at the top left of the screen. This shows you all of the buildings in 3D getting larger as you move towards them. What makes life even more difficult is the fact that they gradually blend into the background as the sun sets. Before you know it, you could have run headlong into the side of a building. Don't worry too much though as your ship is supplied with flares which will light up the sky and an infra-red system which will also make life a little easier.

Not only do you have to worry about the buildings shooting at you but you are bound to come up against some of the planet's mobile defences. These are mainly Hunters mark I, II and III. These are really flying saucers that have a habit of creeping up on you from behind.

Tau Ceti can be looked at from two different angles. Firstly you could say that it was a shoot'em up, since you can gain points by simply flying around and blasting everything in sight. On the other hand you could also describe it as an adventure since the instructions don't tell you about everything you meet and a lot of the time you will have to figure things out for yourself.

Tau Ceti is an extremely fast game with excellent graphics and more than a few surprises in store. If you fancy being the saviour of a planet yet again go and give it a whirl.

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BASIC COMPILERS

Allen Webb with a round up of basic compilers now available.

MANY COMMODORE 64 USERS ARE happy to program in Basic but perhaps become a little unhappy when it comes to the speed of execution. The alternative of learning a new but faster language won't appeal to all computer owners so a way of speeding up Basic is required. Enter the compiler.

In this article I want to do two things:
1) Explain how compilers work and suggest why you might need one.
2) Comparatively review some of the compilers curently available.

Basic Faults

First, let us consider what is wrong with Basic. Two real drawbacks arise:
1) It's bulky.
2) It's slow.

Why is it bulky? Consider the simple line:

```
10 POKE1024,23:Y=TAN(X)
```

If you look at how this line is stored in memory, we get the following picture (please note that all numbers are in hexadecimal):

```
17 08 0A 00   97    31 30 32 34 2C 32 33 3A 59 B2 C0 28 58 29 0 0 0
link  line    POKE 1  0  2  4   ,  2  3   :   Y  =  TAN  (  X  )
byte  number
```

As you can see, Basic is stored as a series of numbers. Keywords such as POKE are stored as a single token and numbers and other characters are stored as ASCII values. The link bytes point to the start of the next line and the line number is stored as a 16 bit number. In all, very RAM hungry.

When a Basic program runs, the interpretor scans each line in turn and checks the byte sequence according to the syntax rules. Tables help it to convert a token to the start address of the ROM routines. This all takes time. The real cruncher is that this process is repeated each time a line is executed. The process of examining the line and sorting out the routine to execute is called compilation.

The obvious way of speeding up matters is to perform compilation once only and leave it at that. Since the only real virtue of having an uncompiled program is that you can list and edit the program, once a program is finished, you don't need to list or edit it. This is the fundamental idea behind sensible languages such as FORTH and PASCAL. These use an editor to allow you to write and edit a source code. Once it is written, the code is compiled into a fast but unlistable object code.

So how do compilers improve performance? In simple terms, the code is converted into a simpler form. Key words are converted to jumps to machine code routines, variables are rationalised and unnecessary trivia such as link bytes are removed. The result is a machine code program rather than a lump of meaningless code which needs translation. Most compilers use a library of routines. This is tacked on to the end

Table 1: Benchmark 1

	Size (blocks)	Speed Increase
Basic	1	–
Blitz		
IFN	24	8.8
FP	24	3.7
Laser		
INT	23	6.7
FP	32	1.9
Basic 64		
IFN	22	7.9
FP	22	3.0
MC	23	12.9
Petspeed		
INT	33	8.8

Table 2: Benchmark 2

	Size (blocks)	Speed (seconds)
Basic	1	9.18
Blitz	25	8.67
Laser	32	8.77
Basic 64	22	8.7
Petspeed	33	8.65

Table 3: Benchmark 3

	Time seconds	Speed increase
Basic (INT)	12	–
Blitz (INT)	2	6
Laser (INT)	2	6
Basic 64 (INT)	2	6
Basic 64 (MC)	1.4	8.6
Petspeed	1.62	7.4

Table 4: Benchmark 2

	Object code size (bytes)	% size reduction	compression (%)
Basic	25789	–	–
Blitz	23883	93	69.5
Laser	28657	111	69
Basic 64	26825	104	82
Petspeed	30250 (24763)	96	65

of the compiled code. For some reason (possibly after the system used in PASCAL), this library is generally called p-code.

In this article, I will refer to the starting Basic program as the source code, the compiled Basic as the object code and the tacked on library as the p-code.

Because a lot of unnecessary garbage has been eliminated during compilation, the object code is smaller than the source code. Since, however, you have the p-code tacked on the end, the object code may not be smaller than the source code. Generally, small source codes will be larger on compilation and large programs smaller. Consider a hypothetical compiler which gives 65% compression and has an 8K p-code block. If the source code is X kilobytes in size, the object code size will be .65X in size. The size of complete compiled code will be given by:

size = X × .65 + 8

After a bit of algebra this equation can be solved and shows that any source code less than 22.9K is larger when compiled and any above 22.9K is smaller. As I will describe later, there are exceptions to this simple system.

An additional bonus is that compilers can allow extra tricks. Some, for example, allow illegal integer loops. Benchmark 1b is illegal in Basic but can be compiled and used.

As far as I am aware, there are five compilers currently on the market. Whilst I have used all five, I can only comparatively review four of them. Generally, compilation is more easily achieved if you have a disk drive, but there are two cassette compilers around.

I will now take a brief look at some compilers.

Blitz (Disk Only)

This disk based compiler of German/Austrian origin is available from Supersoft. A cutdown version called Mini-Blitz was distributed by the now defunct STACK computers and may still be available.

Blitz is the most tolerant of the compilers tested in that it will accept most Basic extensions. It also gives the most compact complete. In spite of it being rather long in the tooth, it's my favourite.

Blitz attempts to convert all variables to integer unless a floating point value is used or if the variable is out of the integer range.

Basic 64 (Disk Only)

Another continental product, this compiler is distributed by First Publishing. It's the most versatile of the lot. Two "optimisers" are offered. One is purely floating point and the other integer. These both use p-code. A machine code option is available with the integer optimiser. I don't know how this is different to p-code but it gives faster albeit bulkier object codes. Lots of other options are available catering for all possible needs. Basic 64 tends to be rather slow when compiling with continuous accessing of the disk. The other remarkable feature is the extremely obscure instruction book. I know it's a translation from German but it's really not good enough.

Laser Compiler (Disk and Cassette)

This product is marketed by OCEAN/OASIS and is provided as a complement to the earlier products *Basic Lightning* and *Laser Basic*. These are two extended Basics offering excellent graphics facilities. In addition to offering a dedicated complier for these products, there is also a compiler for normal V2 Basic. I shall be looking at the normal compiler only. Both floating point and integer options are supported.

The product is available to those without disk drives, which is a nice bonus. I found the compiler rather pedantic and it certainly doesn't recognise any Basic extensions. Additionally, I experienced one or two inexplicable crashes when running compiled codes. Oasis is aware of this and is looking into it. *Laser* is the fastest when compiling. When dealing with small programs, all compilation takes place in the machine. This is a nice touch that other compilers could mimic.

Petspeed (Disk Only)

This is another well known compiler which, at one time, was distributed by Commodore. It is now being distributed by System Software. Whilst being extremely pedestrian when compiling, the resulting object codes zip along at quite a lick. No Basic extensions are supported but it seems to handle most programs without coughing. Another oldie but goodie. The fact that *Petspeed* has been rereleased at a price below £20 should add to its appeal.

Jetpack (Disk and Cassette)

I have seen this compiler quite some time ago but don't have a copy so I couldn't test it. *Jetpack* is produced by ETL who came up with a pretty good compiler for the PET. Again, cassette users will probably want to look at this one and the low price will be an attraction.

Comparison is not easy. I shall use a number of benchmark programs to get some quantitative data and then make a qualitative assessment.

Benchmark 1 simulates a commonly encountered situation. We want to fill the screen with a specified character. Two versions of the benchmark were used. Version 1a tests a simple loop and 1b tests a normally illegal integer FOR/NEXT loop.

Benchmark 1a

```
5  TI$="000000"
10 FOR I=1024TO2023
20 POKEI,42:NEXT
30 PRINTTI
```

Benchmark 1b

```
5  TI$="000000"
10 FOR I%=1024TO2023
20 POKEI%,42:NEXT
30 PRINTTI
```

The results were as shown in Table 1.

The abbreviations have the following meanings:
IFN: integer FOR/NEXT loop used
INT: integer variable used
FP: floating point variables
MC: *Basic 64* claims a machine code mode which is faster than it's p-code mode.

So what does this first bench mark tell us? Since the source code is of minimal size (less than 256 bytes), the size of the object code is near enough the same size as the p-code overhead. That being the case, there is little to choose between *Blitz* (both integer and floating point), *Basic 64* (all modes) and *Laser* (integar mode). *Petspeed* and the *Laser* floating point p-codes are somewhat larger.

In terms of speed, there is an obvious increase when using integer instead of floating point. This is inevitable since floating point routines are slow. Floating point is also wasteful in memory use. *Petspeed* and *Blitz* gave the fastest performance although the *Basic 64* machine code mode was best of all.

Benchmark 2 doesn't tell us much about the compilers other than show how slow floating point routines are (Table 2).

Benchmark 4

```
5  TI$="000000"
10 FOR I=0 TO 3.14 STEP.02
20 Z=SIN(I):21=COS(I)
25 NEXT
30 PRINTTI
```

These figures suggest that *Blitz* and *Petspeed* have the edge but only by a slim margin.

The benchmark 3 attempts to simulate a real situation. Here we use a bubble sort to arrange 30 strings in alphabetic order. The time to perform the sort is monitored.

Benchmark 3

```
10  DIM A$(30): X=RND(-1)*1
20  FOR S = 1 TO 30
30  FOR T = 1 TO 10
40  A$(S)=A$(S)+CHR$(RND(1)*26+65)
50  NEXT T
60  PRINT A$(S)
70  NEXT S
80  TI$="000000"
90  FL=0
100 FOR I = 1 TO 29
110 IF A$(I)<A$(I+1) THEN 130
120 IS=A$(I+1): A$(I+1)=A$(I): A$(I)=I$:
FL=1
130 NEXT I
140 IF FL=1 THEN 90
145 T=TI
150 PRINT:FOR I = 1 TO 30
160 PRINTA$(I)
170 NEXT I
180 PRINT"ELAPSED TIME = "T/60"
SECONDS"
```

Table 5: Overall comparison

	Basic 64	Blitz	Laser	Petspeed
Speed (Int)	1	3	4	2
Speed (FP)	3	2	4	1
Overall Size Reduction	3	1	4	2
Compression	4	2	3	1
Basic Extensions	2	1	4	4
Options	1	2	4	2
Reliability	3	1	4	2
Speed of compilation	4	2	1	4
Cost	3	3	2	1
Documentation	4	2	2	1
Overall position:	3	1	4	2

The results are shown in table 3. This time *Blitz*, Laser and *Basic 64* in integer modes were pretty well identical. *Basic 64* in machine code mode and *Petspeed* performed well.

One final check to be made was a comparison of compression when compiling a large program. For this purpose, I created a synthetic program of about 26K in size. Table 4 shows the effect of compilation.

This table requires a little explanation. *Petspeed* saves the object code with a complete set of variables. Whilst this is the largest space the program will ever occupy, it is an additional overhead. I have estimated the space occupied by the variables and have put the estimated size of object code plus p-code in brackets. The second column gives the difference between the size of the object code plus p-code and the source code. The last column gives the difference between the object code and the source code and is a direct indication of the degree of compression.

Clearly, *Blitz* gives the greatest overall size reduction and *Petspeed* the worst. In terms of compression on compilation, there is little to choose between *Blitz*, *Laser* and *Petspeed*. I haven't included *Basic 64* in machine code mode since it gives bulky object code with large source codes.

OK, it's time to say which compiler is best. Being a bit of a coward, I will not fully commit myself since different users seek different attributes. To help comparison, I have used a well known ranking tool. Table 5 shows a number of criteria. The performance of each compiler has been scored in order of performance (1=best, 4=worst). The total score is a simple sum of the individual rankings. In reality, of course, different criteria will carry different weighting. There, I'm afraid you must place your own priorities.

Reliability is an odd parameter which I've included to add a subjective element. It reflects how readily a compiler handles any program, whether it gives unexpected errors or crashes and general useability.

Well there you have it. Despite being long in the tooth, both *Blitz* and *Petspeed* are still pretty good. *Basic 64* is incredibly versatile with lots of features and it can offer very fast integer programs. When it comes to program size, floating point speed and documentation, it's not quite there. As a *Basic* compiler, *Laser* isn't quite up to the opposition, but most users will buy it since it compiles the excellent Oasis extended Basics. It will therefore corner a piece of the market on that basis alone.

I want to finish with some comments for our friends with Commodore 128s. You'll be pleased to hear that their are two compilers for you. Since I don't have a 128 I haven't tested them. You should not, of course, assume that the performance of these compilers is in any way reflected by the 64 versions since we are dealing with a different machine using a different Basic. The following comments are based on a reading of the instruction booklet so take heed!

Petspeed 128 (Disk)

The compiler appears to support most of basic 7.0. There are one or two oddities but these aren't much of a problem. There are a number of enhancements not covered in the 64 version. These include option long variable names, Basic extensions and improved file handling. The p-code overhead is about 11K and the break point at which you achieve compression on compiling is about 20K.

Basic-C128 (Disk)

This is the First Publishing upgrade of *Basic 64*. It appears that all of the *Basic 64* options are supported. In addition, some enhancements are offered. It appears that the compiler uses its own floating point routines giving a claimed five fold increase in speed. If this is the case, it is an important and valuable feature.

FINGERS MALONE

Mastertronic £1.99 C-16

Originality 5 Playability 9 Graphics 7 Value For Money 9

IF YOU'RE LOOKING FOR an arcade game which is addictive, fast, colourful and very exciting then you have to buy this.

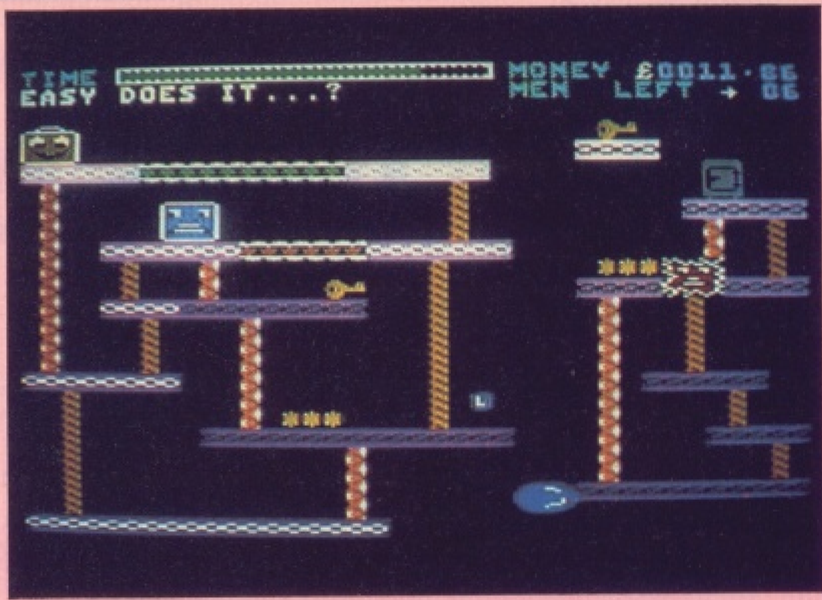
It's a really basic platform game with a few frills but I had to tear myself away from it to come and write this review.

You have to collect keys, avoid menacing suitcases and open a safe before dashing to the exit to get to the next of the 15 screens.

It's incredibly frustrating because it's very easy to die but having said that there's no way that you can leave it alone until you've achieved a certain level and then you'll be itching to get back to it to improve on your performance.

The colours are pretty making the screen extremely attractive to look at and there are one or two quite good sound effects.

This game is not for those who relish intellectual pursuits but if you want something which will keep you occupied for a couple of hours without straining your grey cells then you couldn't do better than go and buy this. Good fun at a very good price. **M.C.**



STREET OLYMPICS

Mastertronic £1.99 C-16

Originality 3 Playability 4 Graphics 5 Value For Money 4

IF YOU'VE EVER SEEN SUMmer Games then you'd better not have a look at Street Olympics because the contrast would shock you.

I know it's a budget game but I have to say that there is very little in the way of enjoyment here.

There are four events at which you can try your hand and all of them are basically the same. The sprint merely involves running along a very repetitive Coronation Street type road. The faster you go, the nearer you get to the record and that's it.

The jogging event is absolutely identical so it's probably best to miss out that option and go on to the next one which is jumping.

This is the same as the sprinting and jogging except that you have to leap the odd brick wall every now and again.

The throwing is a variation on the same theme except that when you stop running you have to throw a ball.

This kept my attention for a maximum of five minutes and although buying it wouldn't break the bank, I couldn't recommend it. Sorry, Mastertronic. **M.C.**



BEER BELLY BERT'S BREW BIZZ

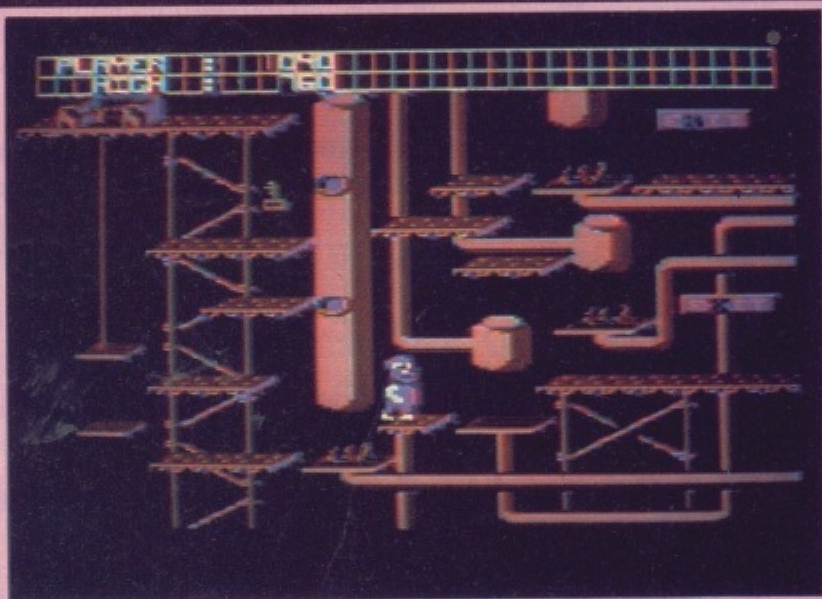
US Gold/Americana £2.99 C64

Originality 5 Playability 7 Graphics 5 Value For Money 5

THIS GAME IS SET IN A brewery as the title may suggest to you, and the central character is a rather fat purple alcoholic who explores the brewery presumably in the hope of getting a free drink at the end of it.

There are several sections of the game but all are fairly similar. I'm sorry to say. It's a platform and each screen has to be completed in order to progress to the next there are various walls which get in your way and you have to pick up objects in order to remove these obstacles.

I can't say that it was particularly addictive since I've seen a lot like this before and in all of them the graphics have been better and they have been far less tedious to play. Beer Belly Bert is not very agile, I suppose it's something to do with the state of his liver. He seems to find it a little hard to move around but that's not really surprising with his figure. Judging by his colour he hasn't got long to live because if the cirrhosis doesn't get to him first then the high blood pressure certainly will. **M.C.**



TIME TRAX

Mind Games £9.95 C64

Originality 6 Playability 8 Graphics 8 Value For Money 7



IN A BUNKER AFTER A holocaust, one survivor, your honourable self, is being irritated by another survivor i.e. Uriah Winterbottom M.Sc. luckily he dies so that you are left in peace, however, not before he's had time to tell you about what the Dark Ones are getting up to these days.

Unfortunately, at this point in my reading of the instruction booklet, I became thoroughly confused because Mind Games had already spelt 'psychic' in two different ways and I wasn't sure whether I dared read on to find out if there were yet more ways of spelling this complicated word. I solved it by presuming that every word beginning with 'P' meant the same.

The Eight Minds, who seem to represent God, in this good versus evil simulation, have lost their most treasured possessions. You have to find them and restore them to the good ones whilst avoiding the forces of darkness. These items are scattered throughout time and you must utilise the flashing time portals to enable you to achieve this wondrous feat. There are various different ages in which you can find yourself including Wilderness, Holocaust, Ice Age and Dawn of Man. These are all pretty awe inspiring and there are an awful lot of frightful creatures which will make sure that you never get where you want to go.

The time portals have a very nasty habit of disappearing just when you want to use them and then you have to hang around for a while waiting for a new one to appear.

A lot of this may sound as if I didn't like the game, and that's not true at all. It's merely very frustrating and fairly complicated to get started. Once you have managed to get on your way then it becomes very interesting and although this can take a while it is actually worth it.

I would recommend that you read the instruction booklet a couple of times before you even load up Time Trax. It's only about 10 pages long. Even when you've done this you'll find that you have to keep referring back to it until you have a good grasp of what's going on.

Your first aim should really be to get yourself a weapon and some ammunition as there isn't really much you can do without this amusingly essential asset. Possible weapons are pistol, crossbow and wand and their respective ammunition is bullet, bolt and gem. Without these you won't get far but at least you'll be able to enjoy the spectacle of yourself as a white robed angel rising up into the wild blue yonder.

As graphic adventures go, it's got a lot of qualities. Your energy is indicated by a red heart in the bottom left of the screen which gradually drains of colour as your life blood runs out. Gross but graphic.

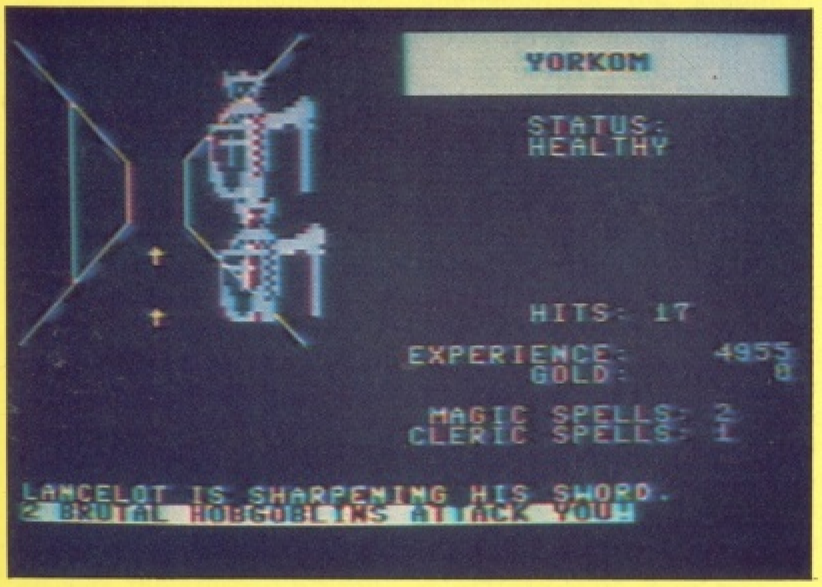
If you're the sort of person who wants to spend a lot of time over a game then I believe that you will enjoy this. There's quite a lot of variety and it is tricky too.

M.C.

THE STANDING STONES

Ariolasoft £14.95 C64

Originality 4 Playability 5 Graphics 8 Value For Money 6



ROUND ABOUT THE TIME of King Arthur, Merlin, the famous magician decided to throw a party to end all parties. So successful was it that even many hours later, all the guests were still sleeping soundly having eaten and drunk far too much. All the guests that is apart from one. For a certain Kormath, the sticky fingered one, was busy stashing away as many silver spoons and plates as he could fit into his hat.

That was bad enough, but it was the fact that he also took the Holy Grail and the magic sword Excalibur that annoyed everybody most of all. Merlin promised revenge and offered great fame and fortune to anyone who could recover the items. Lancelot too promised to help in whatever way he could. And so all that was required was a brave knight to venture into Kormath's dungeon beneath the magical Stonehenge and recover the treasure.

Your knight has five different traits which determine his character. Virility determines your strength and ability to carry treasure. Intellect is important for spell casting of a magical nature whilst holiness is more concerned with clerical spells. Agility is a measure of lock picking skills ang general speed of mind and body and initial hits is an indication of how much damage your body can suffer. The points are randomly determined but you get the opportunity to change the whole set as often as you want until you end up with a decent series of numbers.

You will need to save your character frequently and can have up to 16 knights stored on disk. One slight problem is that the disk supplied has no write protect notch cut in the side, so unless you cut one yourself, you cannot save anything! The Standing Stones is quite fun to play although it looks very dated now (it was written back in 1983). There are several more sophisticated role playing games on the market (noticeably the Ultima series) but this one is very easy to get into and may well pass away an idle hour when you are looking for something not too demanding.

G.R.H.

TRAP

Alligata £7.95 C64

Originality 8 Playability 8 Graphics 9 Value For Money 9

ONE OF BRITAIN'S BEST known programmers, Tony Crowther, started his career working for Alligata a few years ago. After many wanderings, events have now turned full circle and he is back where he started from. Alligata has always claimed that his best work was written there and his latest game would appear to prove the point. Trap is quite simply one of the best shoot-'em-ups that I have seen and oozes class from almost every pore.

My initial reaction to playing the game was that it looked like a thinking man's Zaxxon. The appearance is that of a scrolling screen (although it scrolls vertically and not diagonally). You fly through gaps in walls, blasting everything in sight. But there is a lot more to it than that. Down in the bottom right hand corner is a small table marked A,B and L together with some numbers. These indicate the number of aliens, boats and lasers that still remain to be destroyed before you are allowed to land. An exclamation mark in one of the columns indicates a figure of more than 9.

Succeed in shooting the necessary numbers and the background changes colour to red allowing you to land your craft and continue your mission on foot in a space version of commando. But more of that anon.

Before you can start eliminating aliens and lasers, you must first negotiate your way through a field of space mines. There are no points to be scored for blasting them, you only do it to clear a path for yourself but even so, careful flying is necessary as one slight collision takes you back to the start minus one of your lives. Control of your ship is quite straightforward being left and right, accelerate and brake. Fire shoots a missile and pulling back on the joystick and firing simultaneously drops a bomb. There are also keyboard options if you don't like using a joystick.

Bombing is necessary for destroying boats and fuel dumps on the ground. Your ship uses fuel at an alarming rate and if you don't pick up extra by bombing dumps pretty quickly, you find yourself hyperspaced to level 10 where your chances of survival are, to put it mildly, minimal. Also worth looking out for the ground are the eyes. These act as radar systems and warn the police of your intrusion. If you don't take out the eye quickly enough, you must fight off a convoy of police craft although there is a hefty bonus is you shoot all of them.

If things really get to be too much for you, you have a smart bomb at your disposal which instantly destroys everything on the screen although the kills are not credited to your list of things to be shot. One final way of destroying something is by doing it backwards! By careful manoeuvring, you can dispose of an enemy craft by using the flames of your engine.

Whilst you are busy shooting everything that moves, you must still pay attention to where you are going. Some parts of the superstructure are taller than others and an accidental collision can have disastrous effects. Watch for the dark shadows. There are various types of alien craft, all of them hostile, some of them indestructable and all doing their utmost to remove you from the scene. One that is especially worth looking out for though is the cargo ship. Blast this and its cargo is released into free space. Collect the cargo and then drop it to the little men that are wandering about for a bonus life.

When you have landed your craft, your little pilot gets out and you can start blasting everything on foot making sure that you don't get killed or fall down one of the holes. There is method in this apparent madness for you are searching for orbs, the local currency. Up to four can be carried at once (any extra just score you bonus points) and they are used to buy yourself a bigger and better ship. When you start the game, you have no choice as to what craft you use. If you have some orbs to spend however,





then you have access to different models. These give you different ammo capacities, rates of fuel consumption, cargo carrying potential and recharge time between zapps. Which ship you choose is dependent on your own personal taste and is limited only by what you can afford. Should you have the misfortune to get hit or walk off the end of the platform, then you return to the beginning of the level although you do not suffer the added indignity of losing a life.

Everything about Trap is well thought out. The graphics look stunning, even the instructions show the pages of a book turning as they display the different types of alien craft that you are likely to encounter. The game itself plays exceptionally well and possesses that indefinable little something that makes you want to have "just one more go." There is even a hidden demo mode but as we are under strict instructions from Alligata, you will have to find this for yourself. It lasts for about seven to eight minutes and is the music for the game with a character reminiscent of those huge, bald overseers that they have in all the old films about galley slaves where he does nothing but beat his large drums in order to give the rowers a rhythm. The music is highly atmospheric and there is also a stereo mix for you to play and hum along to.

If Trap is going to be the standard of products from the Tony Crowther/Alligata partnership, game players everywhere will be hoping that they stay together for a long time.

G.R.H.

GHOSTS 'N GOBLINS
Elite C64 + Joystick

Originality 8 · Playability 8 · Graphics 8 · Value For Money 8

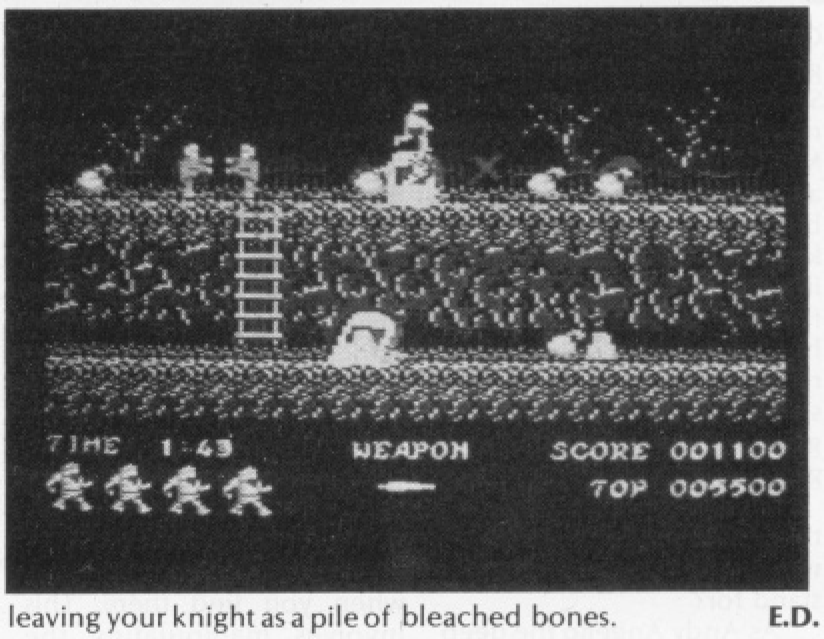
I FOUND THE ARCADE version of Ghosts and Goblins to be an extremly easy way to lose money very quickly and I'm pleased to see that the computer version is just as demanding.

The object of the game is to rescue yet another princess from an evil wizard who has summoned zombies and demons to thwart your knight in shining armour who is in quest to free the unfortunate young lady.

The instructions with the game are minimal and I feel that a little more help would have been useful. As it stands you will have to play through many screens advancing your knowledge little by little.

Each knight has two chances to succeed. The first time that he is hit by one of the creatures he loses his shining armour and ends up dashing around in a loincloth until he can regain his armour. His weapons change too as he fights better equipped demons and takes over their arms when he defeats them.

I loved this game but it is very, very difficult to play. Even the first screen is difficult and the hosts of ghosts and goblins will overun you in seconds, leaving your knight as a pile of bleached bones.



E.D.

THE LAW OF THE WEST
US Gold C64 + Joystick

Originality 2 · Playability 4 · Graphics 10 · Value For Money 5

MUTTON DRESSED UP AS lamb is the best description for this game. The graphics are superb but the game's style is as old as them thar hills.

As sheriff of (US?) Gold Gulch a man's gotta do what a man's gotta do, and all this man's gotta do is survive until sunset. In a frontier town like Gold Gulch that ain't easy.

All manner of dudes, hombres and wimmin folk cross the path of the lawman from sun up to sun down and some of these are mean gunslingers. Everyone lives on a knife edge and a line of smooth talking is needed if your going to avoid any early trip to Boot Hill.

Even the Doc's like a bear with a sore head. Him and liquour ain't no strangers and on a morning he sure needs to be handled gently 'cos you're gonna need him before long.

All day long them Daltons are trying to rob the bank, hi-jack the stagecoach or make off with the railroad payroll. Just one darn thing after another. If your draw ain't as fast as a rattler strike you're deader than a night in Milton Keynes.

Strangers keep drifting into town and you never know what's on their mind. Take the Mexicali Kid, he's got so many notches on his gun it looks like a fancy piece of fretwork and yet a nicer guy I've never met, if you know how to handle him.

Miss Rose from the saloon and Miss April the school-ma'am are poles apart but behind this hard steel badge beats the tender heart of a lonely lawman and I know I'll have to make up my mind one day but till then...

The first time I played this game I was impressed. The animation of the graphics looks almost like a cartoon but each time you play the story is very much the same. Each time a character appears you have to select a response to their opening gambit from four alternatives which range from the sickly polite to the meanest varmint who ever walked. Their response depends on the tone of your conversation and if you're not careful you'll have a fight on your hands.

When you draw the characters wandering about in the distance run for cover. A gunsight appears and you must lead it to your target. The graphics of the lawman's right arm as you wave his gun around are a higher calibre than a Remington shotgun. This part of the game does bring out the worst side of human nature. When a child with a secret appeared on the screen as I was playing the game in the office, a chorus went up of 'Shoot the kid!' and who am I to disappoint such an appreciative audience?



At the end of the game you get a rating measured by the number of villains killed, your success in romantic engagements, the number of innocent people you shot unnecessarily and the number of crimes you foiled. In fact, everything you did as lawman for the day is assessed and an icon chart is produced with a numeric score.

How long does the game last? You may well ask how long is a cowboy's lassoo. You can go through the game in no time at all if you shoot everything in sight. The editor proved this to me, I worry about him sometimes (I don't think today's the day to ask for a pay rise!). If you make a few skillful decisions the game lasts for about half an hour. Once you finish, you start again from the beginning to face the same day again as history repeats itself, well almost.

When the novelty of the graphics had faded, I found that the game started to become repetitive. Investigate a few options and increase your score is the best you can hope for. It reminded me of Adrian Mole's game or even the old chestnut which starts with the phrase 'You are the ruler of a country...' but the gameplay in this is not as complex as either. As a budget game this would be superb value but at over £9 there are better ways to spend my cash.

E.D.

C.O.R.E.

A 'n' F Software C64 + Joystick

7 Originality 8 Playability 5 Graphics 7 Value For Money

CORE IS A SPECTRUM game. Even this version is a Spectrum game. Never, since my computer loaded Manic Miner, has it looked more like a Spectrum. I don't want my beloved 64 to look like a kiddies toy I want it to look like a computer. This was my first attitude to CORE but having perservered I've recovered from the culture shock and come to enjoy the game (but not, alas, the graphics or the sound).

Definitely a brain teaser this one, even the name is a mystery. What does CORE stand for?

As Andy Angello the deep space trouble shooter, you receive a message from the Federation. The mining complex on EROC 1 has been recolonised by aliens and the bio memory banks have been scattered. As always you are left to clean up the mess and collect the bio memory segments.

As you teleport down you realise that this isn't going to be easy. The mine's heavily infested with all manner and type of alien and the wretched torches keep running out of batteries.

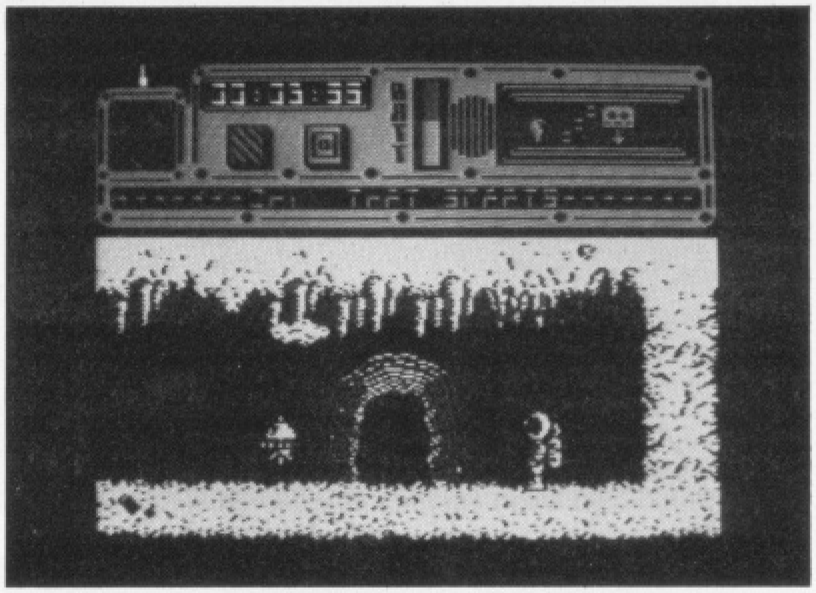
On entering the mine, one thing struck me immediately, no colours. Colours are used but only in that monochromatic way which Spectrum owners have come to know and accept. I don't mind conversions but they should take into account the capabilities of the new machine and not work to the limitations of the old one.

Your first task is to find a metal detector to help find the missing segments. Unfortunately, the detector is buried somewhere so you have to find a metal detector! This search is not helped by the fact that, as time passes, the batteries in your torch start to fade and the sceen dims.

There is an ample supply of fresh batteries in the mine so you have to take them when you find them. This involves manipulating the icons at the top of the screen. I think this could have been easier to do, after all, it did take five MAN years to develop this program (perhaps a woman could have done it more quickly).

The icons allow you to pick up, drop and use any items you find. Only four items can be carried at a time which means a lot of trial, error, exploring and backtracking is involved in the search. Other icons allow you to pause for meals or to save the game at bedtime. There is also a HELP facility which can prove useful, if a little enigmatic.

Not all of the mine is approachable by using the doors and antigrav lifts so you must make use of the teleport facility. This means learning



how they inter-relate because the pre-programmed destination may not be where you want to be, and you have to be able to return.

Collision with one of the aliens will have one of two effects, both of them detrimental. Floating aliens will drain energy from you but collision with a robot will kill you outright.

Whenever you move from one location to another the screen changes in a novel way. The effect looks like venetian blinds being opened and closed to reveal a new room. Sometimes it is difficult to know if you have come up through the floor or simply passed through a doorway. This means you can't always tell where your next move will bring you. Producing a map is essential. Why not enlist Andy's help, you never know.

I've tried to enter into the spirit of the game by not disclosing any of the solutions to the problems. The manual has several tantalising hints for the beginner and added to a modicum of common sense the items which are encountered will soon have a relevance to the game.

A few of the puzzles are related to one another and often the most obvious course of action is not necessarily the best.

CORE promised hours of amusement and I have no doubts that it will. Just keeping the lights on is enough of a battle. This game's a mine of entertainment. **E.D.**

THE COMET GAME

Firebird C64 + Joystick

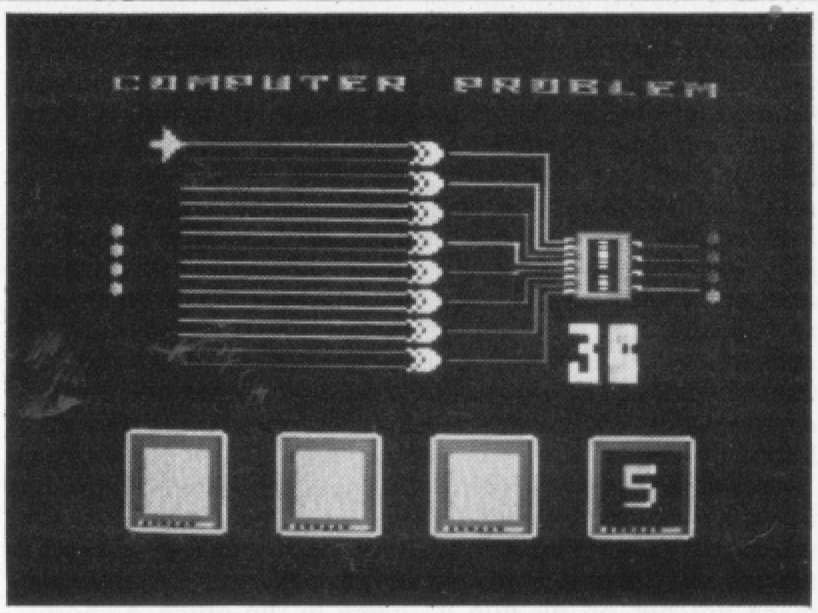
3 Originality 3 Playability 4 Graphics 3 Value For Money

HALLEY'S COMET HAS faded back into the stars but even now it's not as dull as this game. Actually, The Comet Game is not one but several games cobbled together to make a whole (a Black Hole).

Before even sighting the Comet your journey is beset by more problems than the American Shuttle Project. Attacks from aliens, ill-aligned antennae, deadly germ bags in the Life Support System and the all important ceremony of making the coffee.

The alien attack is based heavily on the game where missiles come streaking in and you must create a defensive cloud to protect your base. Antenna alignment is still a mystery to me and I can't say I care. Germ bag infestation is a bit like the bouncing ball demo from the Commodore manual mixed with the excitement of watching wallpaper fade and the excitement of making coffee involves ensuring your hybernating astronauts' bladders don't explode.

Hopefully, once this game catches Halley's Comet it will go past and disappear into the black beyond. I do hope Einstein's Theory was wrong, if space does bend this game will be back to plague future generations.



FLOYD THE DROID

Radarsoft C64 + Joystick

Originality 9 · Playability 8 · Graphics 9 · Value For Money 9

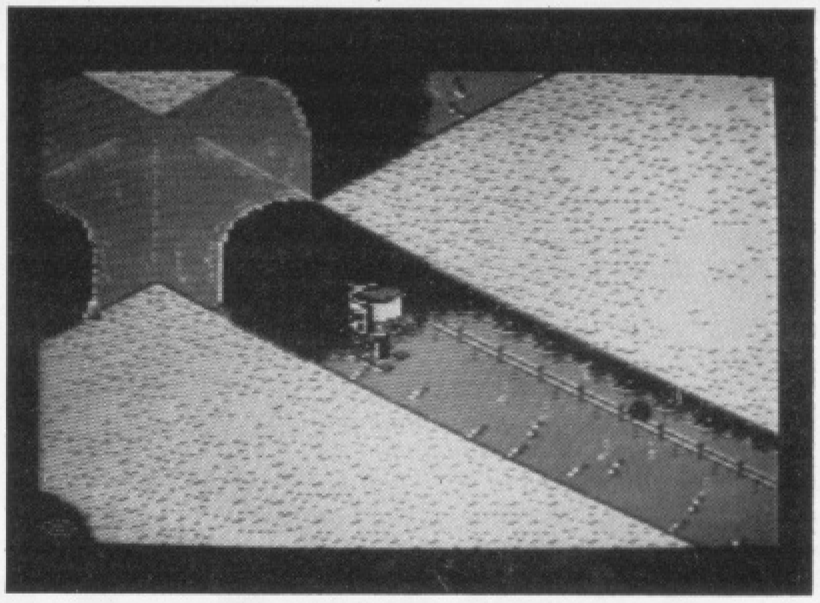
THANK GOODNESS RADARsoft didn't decide to investigate total experience software with the release of Floyd the Droid. Smellivision would be too much to bear as the little robot ploughs his way through the sewers of some of the world's greatest capital cities.

Floyd is a Probot (PROgrammable roBOT) specially equipped for his task of cleaning up these lesser known high spots of the great cities. Looking a little like R2D2, Floyd trundles along on wheels until he meets something which offends his sensory apparatus. This might be a waste blockage or a leaking crack in the pipe but there are greater terrors underground. Bats, rats, alligators and desperate criminals rush around in the gloom and they are joined by Floyd's malfunctioning predecessors who cracked up under the strain.

Probots are equipped to face any problem. They have laser guns in their heads which not only break down blockages but also make suitable weapons for dealing with bats and criminals. Rats and alligators are dealt with in a simple but efficient way, Floyd leaps into the air and crushes them underfoot.

We first meet our overgrown tinny from down under in the sewers of London. The screen displays the first pipeline maze which gives way to the main menu/scoreboard screen. The display shows Floyd's status on the left and the sewer's condition on the right. All problems are stated as percentage. Waste blockages and leaks must be reduced to zero but vermin only need to be reduced by 20%. There is another condition to be met and that refers to the minimum score required to allow entry to the next sewer.

The bottom of the screen displays the options which control Floyd's mode of action. The part of the sewer labyrinth which Floyd has investigated can be viewed, he can be switched into one of three operation modes (manual, semi-automatic or automatic) and he can be programmed for specific actions in automatic mode.



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The final option takes you into the sewer with Floyd and the graphics are very good at this point. We see Floyd in the pipeline from an elevated angle giving a 3D effect. Now the joystick is used to move him along the channels in search of his prey.

Occasionally, the pipeline loops right over Floyd's head. These are danger points and you should prepare yourself for all eventualities. A touch of humour is provided by the Probot's method of awaking bats. By pressing the fire button a speech bubble appears with the word 'Boo' written in it and this is echoed by speech synthesis.

When a creature or obstacle is located, the screen switches to a 2D side view of the sewer. The obstacles are all dealt with automatically by Floyd's ROM programming but vermin can be dealt with either manually or automatically.

For automatic mode and method of dealing with an opponent can be set using one of the sub-menus from the main menu screen. Here each type of foe can be selected by icon and a series of a dozen moves may be programmed into memory. When in auto or semi-audo mode, Floyd will execute the actions and hopefully defeat his opponent.

MAPS BRITAIN

Radarsoft C64 + Joystick

Originality 9 · Playability 7 · Graphics 8 · Value For Money 8

GEOGRAPHY HAS ALWAYS been a painful subject for me. The incisive sarcasm of my old teacher still rings in my ears. If only I'd had this educational game to help me things might have been different.

Maps Britain makes learning fun by combining a quiz with a touch of ITV's 'Treasure Hunt'. The star of this program, however, is the scrolling British countryside rather than the rolling Rice-ish backside of the television game.

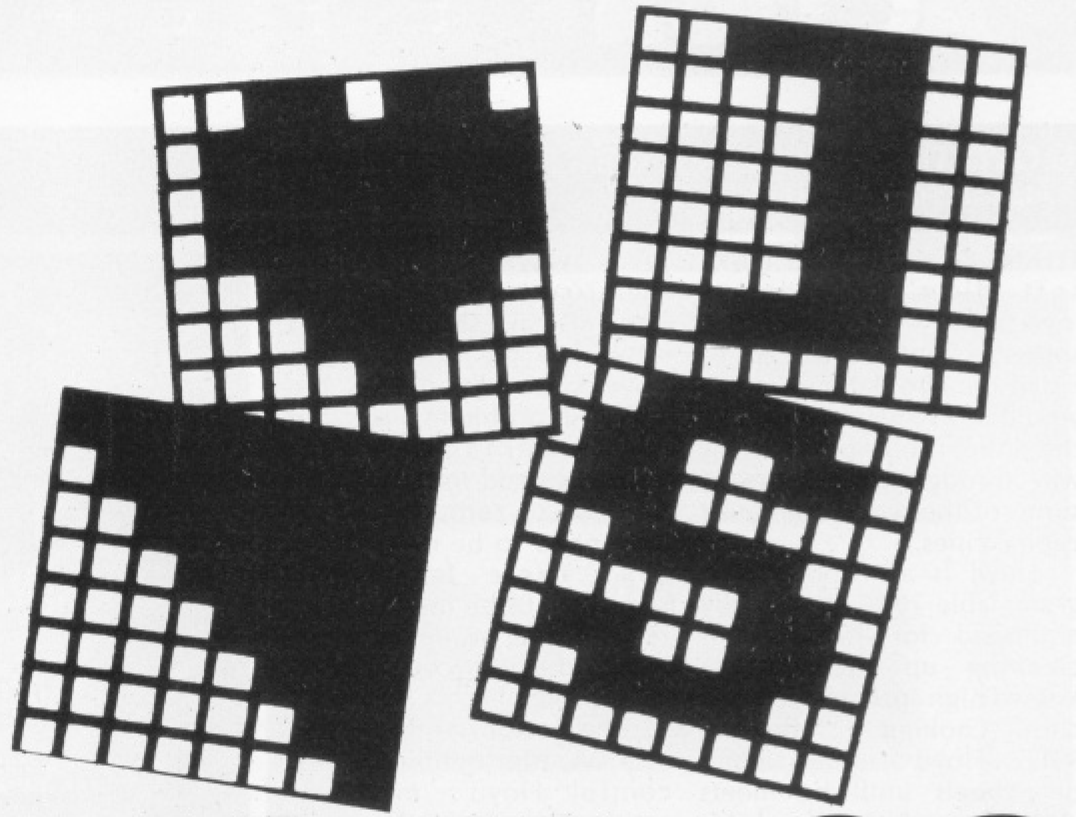
The main options allow you to ask the computer to find a particular place in the British Isles, play a quiz game with the computer or dash around in a helicopter to nominated towns.

The quiz game has four variations. The first two games are similar in that you have to name towns and cities highlighted by the computer. The third game is naming islands and countries in and around the British Isles and the final game involves waterways and counties.

Apart from the first option which involves a limited number of large cities, the level of the quiz is high enough even to challenge a jet-setter like me.

E.D.





LISTINGS

Listings will be much easier to enter with our new system.

COMMODORE LISTINGS ARE RATHER well known for the horrible little black blobs that always abound. Unfortunately the graphics characters which are used to represent graphic and control characters do not reproduce very well and they are also difficult to find on the Commodore keyboard.

In future all control and graphics commands will be replaced by a mnemonic within square brackets. This mnemonic is not typed out as printed in the magazine but rather the corresponding key or keys on the keyboard are pressed. For example [RIGHT] means press the cursor right key, you do not type in [RIGHT]. All of the keywords, what keys to press and how they are shown on the screen are shown below.

Any character that is accessed by pressing shift and a letter will be printed as [Sletter].

[SA] shift and A

[S+] shift and +

Any character that is accessed by pressing the Commodore key and a letter will be printed as [Cletter]

[CA] Commodore and A

[C+] Commodore and +

[C1] Commodore and 1

If any characters are repeated the mnemonic will be followed by a number. This number is how many times you should enter the character. Any number of spaces over one will also be represented in this form

[RIGHT10] press cursor right 10 times

[C+10] press Commodore and + 10 times

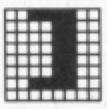
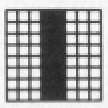
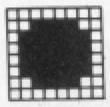
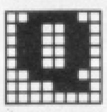
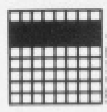
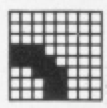
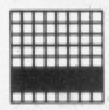
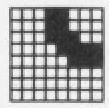
[SPC10] Press the space bar 10 times

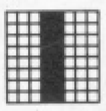
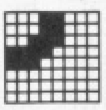
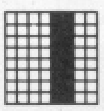
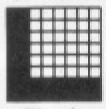
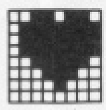
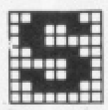
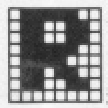
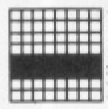
Any other characters should be easily recognisable for example CTRL-N means press CTRL and N and LEFT-ARROW means press the left arrow.

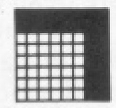
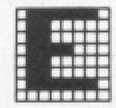
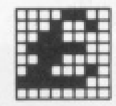
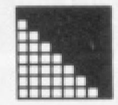
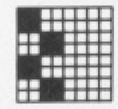
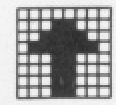
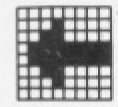
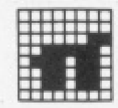
Any number of mnemonics can be enclosed in brackets for example

[SA10,SPC10,SA10]

means type 10 shift A's 10 spaces and another 10 shift A's.

Mnemonic	Symbol	what to press
[RIGHT]		left/right
[LEFT]		shift left/right
[UP]		Shift & up /down
[DOWN]		up/down
[F1]		f1
[F2]		shift & f1
[F3]		f3
[F4]		shift & f3

Mnemonic	Symbol	what to press
[F5]		f5
[F6]		shift & f5
[F7]		f7
[F8]		shift & f7
[CLEAR]		shift & CLR /HOME
[HOME]		CLR/HOME
[RVSON]		CTRL & 9
[RVSOFF]		CTRL & 0

Mnemonic	Symbol	what to press
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8

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Stuart Cooke takes a look at what is available for the C128.

128 ROUNDUP

WHEN THE C128 WAS LAUNCHED, IT was aimed at two different markets. The first aim was to attract the games player and the second to break into the small business market, a market to which the earlier Commodore 64 is not entirely suited.

So has Commodore's little plan worked? Being honest it has and it hasn't. The games player is well catered for with the C128's compatibility with the Commodore 64. However, very few manufacturers are launching games specifically for the C128. After all why writer a game for one market, i.e. the C128 market, when you can write for the C64 market and sell to all 128 owners as well?

As for the business angle, things are looking very good. As you are no doubt aware the Commodore 128 has an in-built Z80 processor and has the ability to run CP/M software. Now packages such as *Wordstar, DBASE* and *SAGE* are all becoming available at reasonable prices. In a future issue of *Your Commodore* we will be taking a very close look at CP/M explaining exactly what it is and how you should use it. All of the above packages and many more will be discussed in further detail in this future article.

The C128 in, its 128 mode, has taken off surprisingly well. Numerous packages have become available and all use the C128 to its full. Most of the software that runs in 128 mode is far superior to that that is available in CP/M mode. The fact that it has been written specifically for the C128 and it is a lot newer probably has something to do with this.

So down to business, what exactly is available for the C128? Is it any good? How much does it cost? Read on and find out.

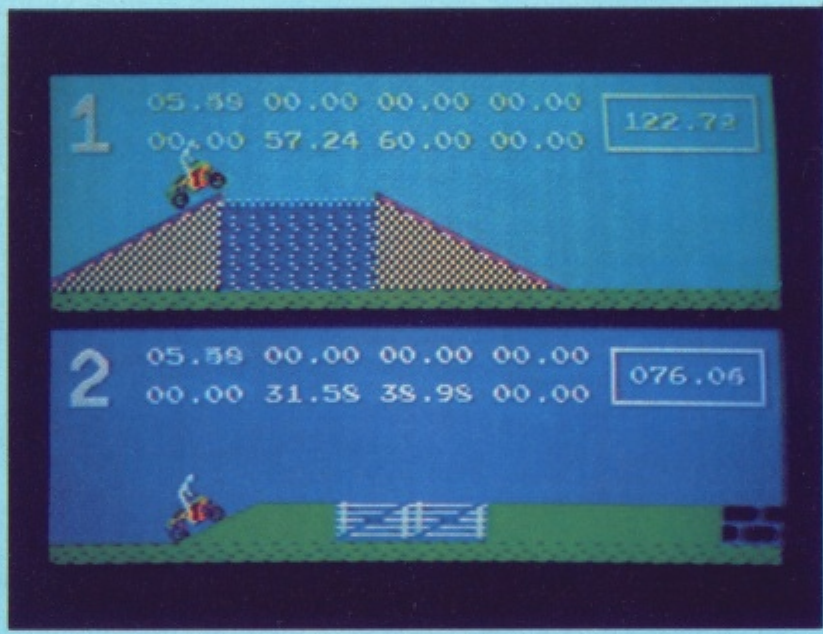


Playing around

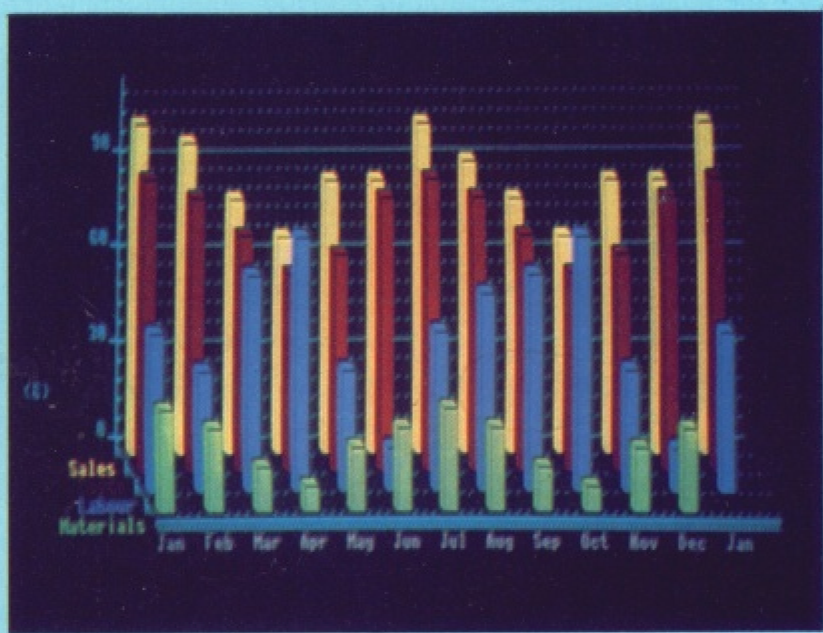
As previously mentioned there are very few games around for the C128, even the American market seems to be very slow on this front which is a great shame as the machines massive memory could lend itself to some very good games.

Mastertronic is the first company to launch C128 games software. I'm afraid that the games are nothing new but are expanded versions of a couple of earlier C64 games, *Kik Start* and *The Last V8*, both of which were very popular on the C64. *The Last V8* finds you seated in a car trying to get back to your base before you die due to radiation poisoning. On









the C64 you must drive around the city and get to the underground bunker once you are there you can try and find your base. The C128 version has an extra screen at the beginning where you are on the planet surface and must collect a number of objects before you gain access to the city.

All in all great fun, although a different game to play.

Kikstart finds you sat atop a motorbike trying to navigate yourself over a number of obstacles. You play against either a computer controlled opponent or you can give a friend a race.

This game offers nothing spectacular though it is quite fun to play. The only difference between this and the C64 version is the addition of some more tracks where you can try your hand.

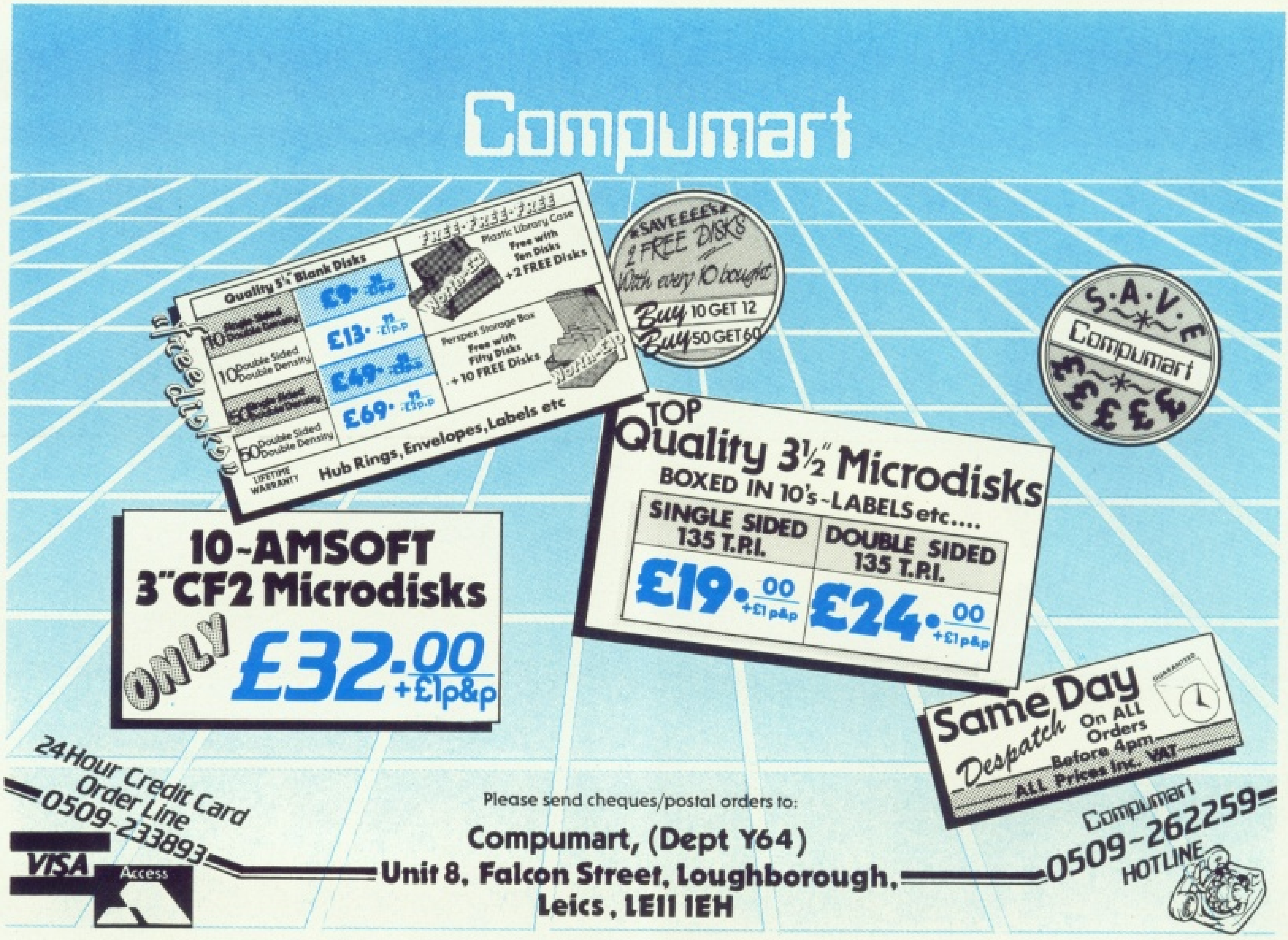
CRL is supposed to be launching a C128 version at the *Rocky Horror Picture Show* though at the time of writing it hasn't been seen.

As far as we on *Your Commodore* are aware, that is all the games that are available for the C128. No doubt some of you out there are going to prove us wrong. I hope you do as the computer certainly warrants some more games.

Down to Business

As previously mentioned the C128 is extremely well supported with some excellent 'business' software. Visa, Precision, Commodore and a company new to the UK. Timeworks have all launched a range or products.

As for the future we will have to wait and see, every day we hear of new products that are planned or due for release. *Your Commodore* will of course review all of these products as they become available.



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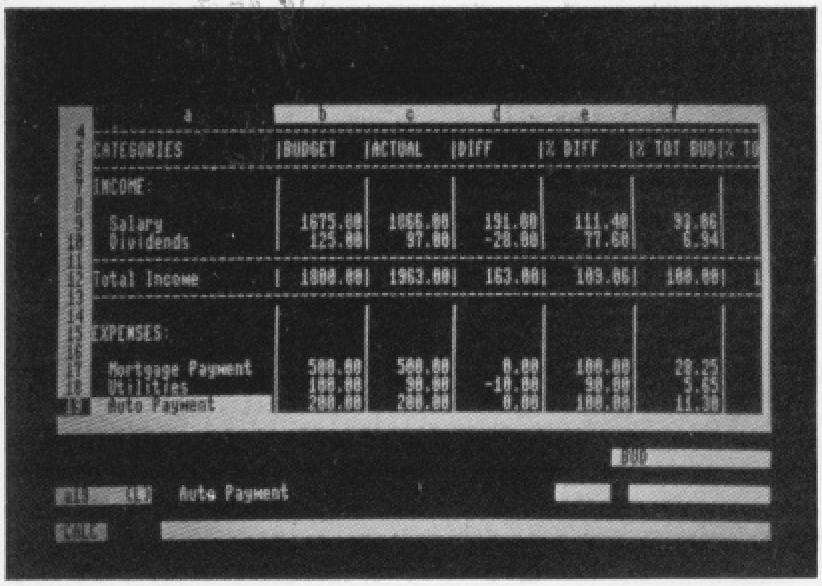
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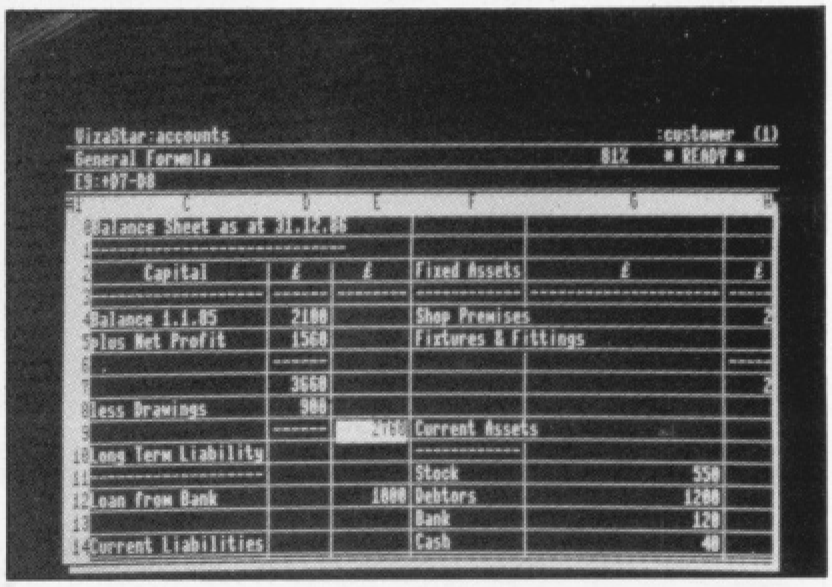
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DOWN TO BUSINESS





Stuart Cooke has a look at spread sheets currently available for the C128.

A SPREAD SHEET IS ONE OF THE MOST important tools for anyone who has to deal with a large amount of numerical data. Basically a spread sheet consists of a piece of paper split into numerous boxes, rather like a piece of graph paper. Each box is then given a particular 'function'. For example the box at the top left hand side corner could be the amount of money in a bank account. The ones below it could be deductions from the account, then at the bottom you could have the new bank balance. You could then work across the sheet using the columns to represent the amount of money in the account at the end of each month.

Obviously until the advent of computers all of the calculations in each of the columns had to be worked out by hand, now the computer has made life much easier for you. You can put formulae into the boxes. For example in our bank account spread sheet the formula at the bottom for the total could be something like: NEWTOTAL=OLD-TOTAL– SUM OF ALL DEDUCTIONS. Obviously the formula would not be entered like this but is does give you an idea about what is possible.

SwiftCalc 128, from Timeworks again, is the simplest program for the 128. In keeing with all of Timeworks' other programs, all commands are available from pull down menus, this makes it very easy to find the comand that you want. *Viza Star* is by far the most complex program but again has far superior features with its inbuilt database, programmability etc. All commands in *Viza Star* are also available from menus making it easy to find the one that you want. Even so *Swiftcalc* is more than adequate for most applications.

Both of the spreadsheets can be interfaced with their corresponding wordprocessors and databases, this means that transfer from one program to the other is free from error, very important if you were producing a financial report for a company.

The actual size of the spread sheet available is far greater than that of the screen. This means that as you move around the screen the columns and rows will scroll across the screen so you can always see the information which you require. *Swiftcalc* allows you to have up to 250 rows and 250 columns in which you can place information. *Viza Star* has 64 columns and 100 rows. As you can see both allow very large work areas.

When you come to printout your spreadsheet you will of course hit a snag. At a guess your printer will only be 80 characters wide. This means that you will have to printout your spreadsheets in pieces or write them in such a way that they only take up 80 columns. *SwiftCalc* gets around this in a very interesting way, it allows you to print the program sideways on any printer that is capable of graphics. In other words all information is printed at 90 degrees to its normal position. You can now print your spread sheets as wide as you want. Sideways is available separately as a C64 program and will work with information from most spread sheets.

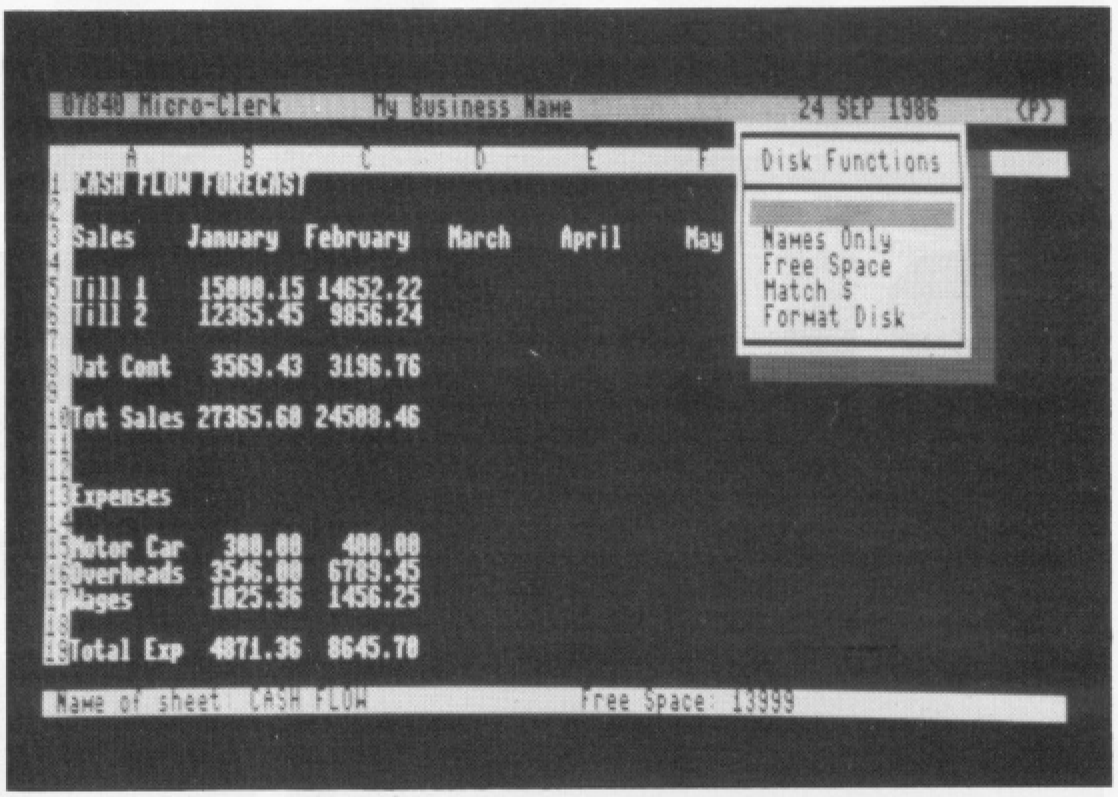
When it comes to having a look at your information what could be clearer than a graph? The GRAPH command in *Viza Star* allows you to turn all of your numerical data into line and bar graphs, it is even possible to print pie charts. When your graph is finished you can dump it to a printer for a permanent record.

Swiftcalc doesn't support graphics but you can transfer the file to the *Data Manager 128* program and use the graphic facilities in that.

Both packages come complete with very comprehensive manuals. *Viza Star* has an excellent tutorial which takes you through using the spreadsheet and database. As usual with the Timeworks manual, they are extremely well presented and explain every function clearly. One chapter of the manual is given over to 'Using *Swiftcalc* on an Everyday Basis' this comes complete with sample spreadsheets for your own use.

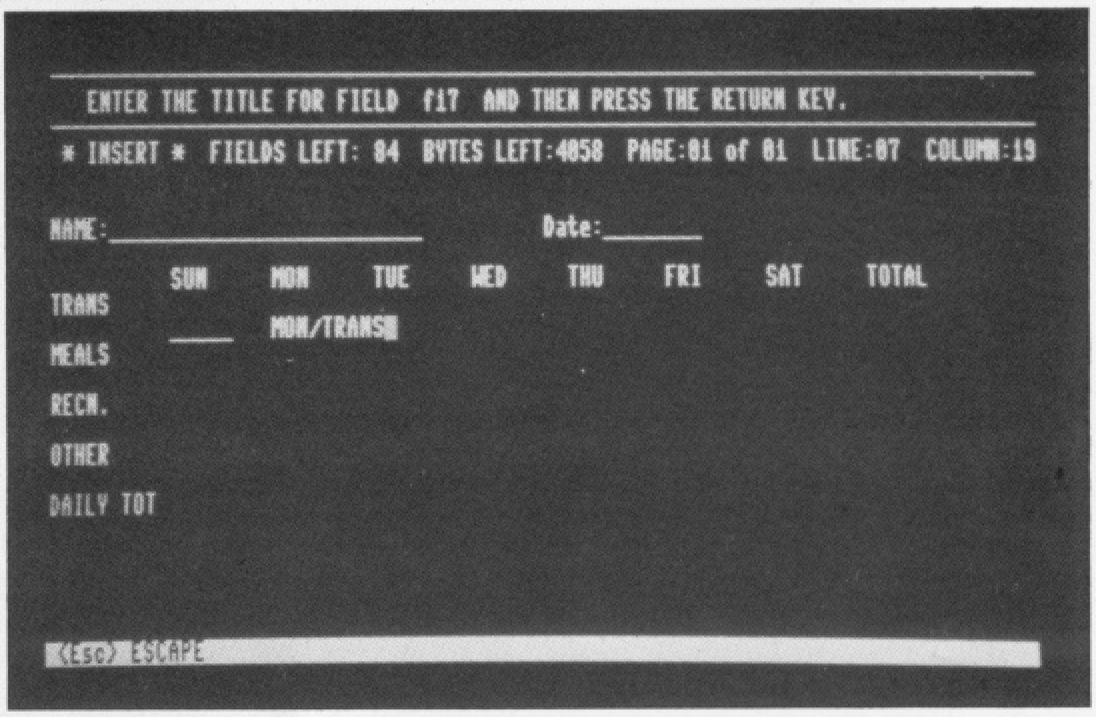
Choosing The Right One

As with all the programs that we have looked at 'you get what you pay for'. Both programs are extremely good, the Timeworks one being particularly easy to use and ideal for someone who wants a basic spreadsheet. *Viza Star* is extremely powerful and is a must for anyone who intends using a spreadsheet for serious business use.



C128 DATABASES

Stuart Cooke with an illuminating look at the C128 databases currently available.



A COMPUTER IS AN IDEAL DEVICE FOR storing information. A database program simply lets you turn your computer into an electronic card index system, a high tech version of those little plastic boxes with the cards in them.

If you have ever used a card index system then you probably know that you need to design a format for each card. For example if you were setting up a list of members of a computer club you may set the cards up so that they have the following information:

NAME
ADDRESS
TELEPHONE
COMPUTER
MEMBERSHIP OWING

Well, a database program is used in the same way, you simply set up the format for each of the cards or records and enter the information.

Because the information is now in a computer you can do a lot more with it. For example you may want a list of all club members who live in London. With the card box type of system you would have to go through each card in turn and make notes as you went along. A computer is much more versatile than that as it takes all of the donkey work away from you. You could instruct the computer to give you a list of all the people who live in London AND who still haven't paid their membership fee. You could even get the database to print out a list of the people's names and addresses on to sticky labels ready to go onto envelopes.

Most database programs also let you transfer details between the database and a wordprocessor or a spreadsheet. This means that you could then send personalised letters to every one who owed money with their name at the top of the letter and the amount owing in the correct place on the letter.

Of all the packages that we will look at here, *Superbase* is probably the easiest one to use for this type of application since you can have both this and *Superscript* in memory at the same time.

Viza Star is a combined database and spreadsheet program which is loaded into memory as one unit. If you wanted to use information from the database with *Viza Classic* then you would have to store the information that you require on disk, then LOAD the wordprocessor so that you could print out the information. I must stress that this is the norm for transferring data between programs and that it doesn't cause any problems whatsoever.

Data Manager 128 from Timeworks also works on the same principle as *Viza Star* and the different programs must be loaded separately.

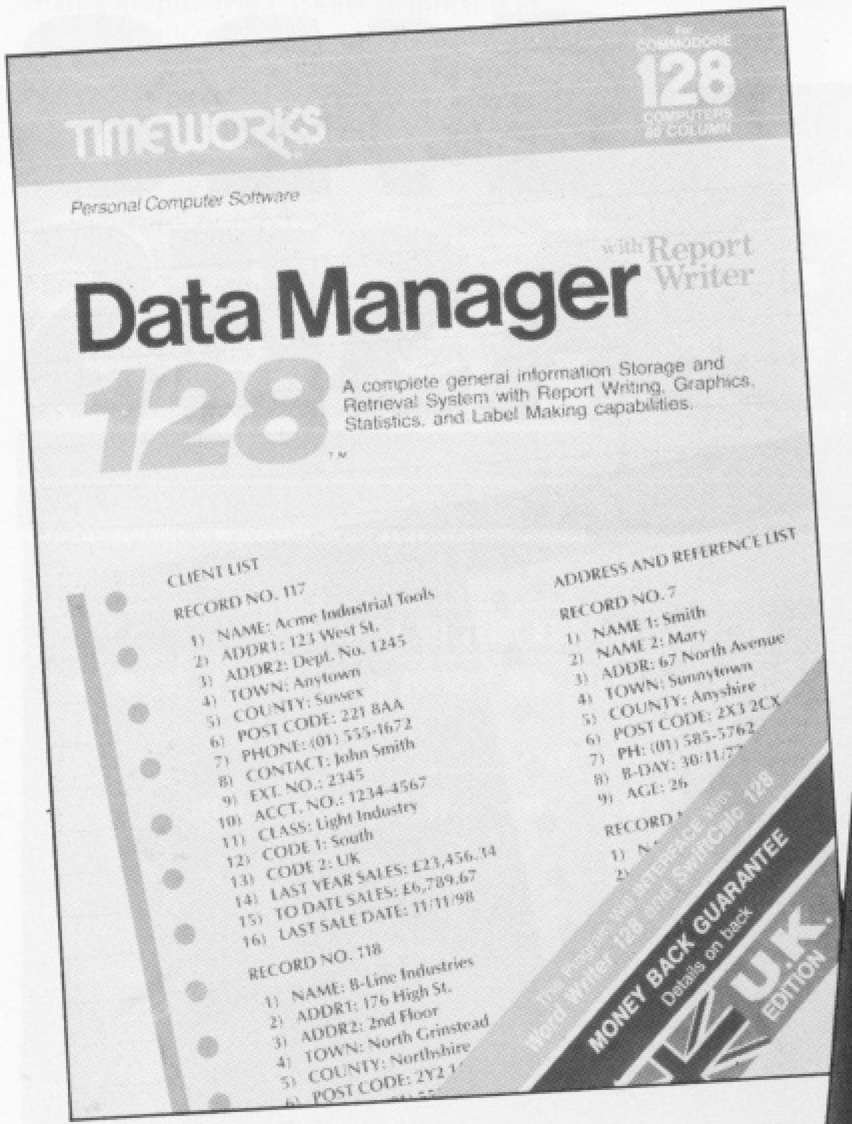
Obviously as with the wordprocessors, you get what you pay for. As the more expensive packages *Superbase* and *Viza Star* are the more complex and versatile programs. Both of these programs have the ability to be programmed. This means that you can actually write a program to control the way that the database works, just as you would a Basic program.

A programmable database is extremely useful. Let's take a look at the typical office where a program such as this would be used. For a start most people in the office will probably not be computer literate. Most databases are quite complex to use and have lots of commands available, to get a database up and running may take quite a number of key presses. The office worker is going to get lost and probably mess things up. Now if you were to write a program that LOADed the correct database into memory and then gave all of the options that the user would ever need on a simple menu, wouldn't things be easier? For example with our club membership list the user may be presented with the following options:

1) ADD NEW MEMBER
2) CHANGE EXISTING INFORMATION
3) SEARCH FOR SPECIFIC INFORMATION
4) FINISH

Now isn't that a lot easier than having to remember a lot of complicated instructions?

Superbase is probably the most powerful database of the three that have been mentioned. Obviously this does





mean that it is quite difficult to use, especially for someone new to computers. The manual wihch accompanies the program can only be described as excellent, the first 56 pages are devoted to giving a beginner's tutorial. Sit down with this for a few hours and you should no longer be frightened by the program.

As if this wasn't enough Precision has also launched a book called quite simply, *Superbase the Book*. If you have never used a database before this is an excellent supplement to the manual as it explains some of the more complex operations in greater detail.

Viza Star is probably the most baffling of the three programs, and probably the hardest to get the hang of. Usually a spreadsheet and a database are totally separate programs. With this package they do rely on each other quite heavily. For example, if you wanted to write a program you actually write it on the spreadsheet. Again a training course is supplied with the program so you should have no problems getting to grips with it.

Data Manager is the most simplistic of the three packages, even so it is extremely powerful and more than adequate for most applications. As with Timeworks' wordprocessor, all the commands in this program are selected from a series of pull down menus. This makes it extremely easy to use. Again a tutorial is included in the manual to help get you going. Data manager is very well suited to dealing with lots of numerical data. The example given in the tutorial is of an expense form for a week. Obviously the numerical functions of this program are not as powerful as those in the combined spreadsheet/database of *Visa Star* but once again are adequate for most applications.

Both *Data Manager 128* and *Visa Star* have graph options built into them. These allow you to graphically represent any numerical information within the database.

So which of the three programs should you buy. As a standard database they all perform equally well, with *Data Manager 128* as the easiest to use. If you are looking for something a little more elaborate then I suggest that you look at both *Visa Star* and *Superbase* to see which one suits you best. Personally I would use *Superbase* since having a combined database and wordprocessor *(Superscript)* in memory at the same time is extremely useful to me. Other people who use spreadsheets more often would obviously be more at home with *Viza Star*.

C128 Revisited



Eric Doyle explains the triple personality of the C128.

WHEN IS A COMPUTER NOT A computer? Arguably, it's when there's no software to run on it. This has been the case with the Commodore 128 so far. 'Ah', you may say, 'there's a wealth of C64 and CP/M software available', but where are the dedicated 128 goodies would be my reply? With all this memory available and an 80-column screen it's like running a Rolls Royce on paraffin.

Things are changing. Already there are two games from Mastertronic (*Kickstart* and *The Last V8*) and a bumper issue of *The Rocky Horror Show* in CRL's pipeline. Precision Software has a brilliant compendium of *Superscript* and *Superbase* competing with Visa's *Classic* wordprocessor. Many more companies are contemplating launching their own and imported titles, so now is the time to revisit the 128 and study the pros and cons of this hybrid machine.

A computer with several modes of operation is a new slant on the incompatibility problems which have beset Commodore since the replacement of the Vic 20 with the C64. At last, buying a new machine does not mean throwing out the old software and brining in the new. In C64 mode the machine operates exactly as its predecessor. Well, almost!

Most 64 software runs happily on the 128 and the earlier models which produced the ocassional 'black' sprite have been superceded by a modified machine. Some programs still hiccup but I've never found this to be a major problem. The real bane of my life emanates from companies who give the impression that their product is C128 compatible when all they mean is that it's a C64 program. Book publishers are also guilty of this sin and the only advice I can give is encapsulated by that old legal saw 'caveat emptor' let the buyer beware.

The styling of the 128 breaks away from the old Vic casing which we've come to know and love. It also provides a substantial shift from the rich man's toy appearance of the Plus/4 which belied the powerful nature of the machine. In the 128 we see a stylish keyboard with a numeric pad which looks rather businesslike and PC-ish. With the work station style 128D, the PC image is complete; built in monitor, disk drive and detachable keyboard.

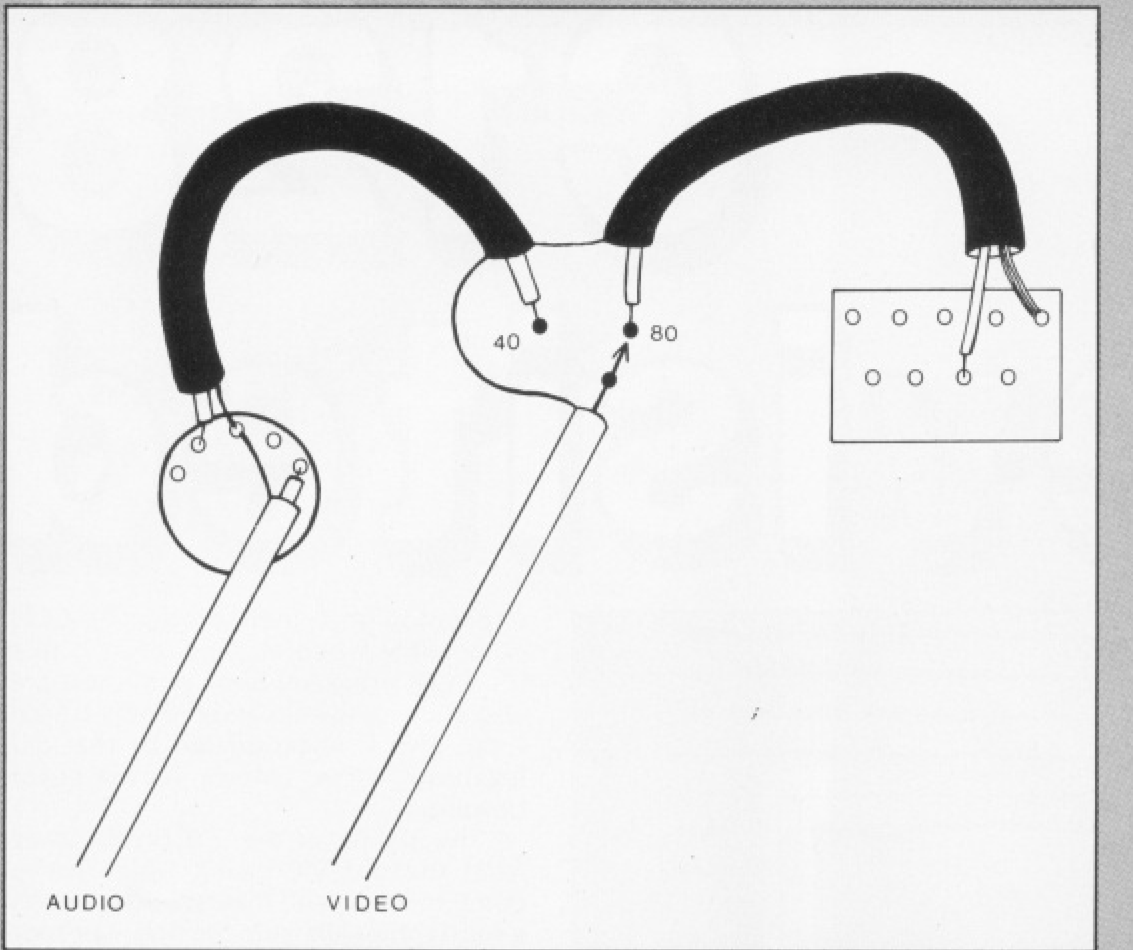
My criticisms are few but heartfelt. Creamy plastic is an aesthetically pleasing colour but it does attract the dirt. With grubby little fingers such as mine typing with gloves on seriously inhibits my two-finger typing speed.

Spark Stuart, our esteemed editor, has a personal problem which he managed to keep secret until the appearance of the 128, he's a flasher. Not the grubby mac in the park variety (as far as I know) but the static electric charge type. Our walking Van de Graf generator only has to look at the joystick port and his finger glows like ET's, closely followed by a flash of such intensity that the internal chips are deep fried in no time at all.

My final small grizzle is about the arrowed cursor keys. One good thing about the Plus/4 was that the equivalent keys were laid out in a diamond formation, on the 128, they are in line.

The 128 has three major modes of operation: C64, 128 and CP/M. This is further enhanced by the 80-column option. The 128 mode's Basic is a vast improvement on the dismal language with which the C64 was cursed. Popular rumour has it that a more advanced language was planned for the 64 but disagreements led to its non-implementation. At least Version 7.0 Basic supports sprites, high resolution graphics, sound and disk access.

A disk drive is a must with so much memory available and if you want to



access the CP/M mode it is obligatory because the system only works with disks. The 1571 disk drive, which is recommended, has one major advantage over the old 1541, it's faster. It won't break loading records but it's a vast improvement.

While I'm on the subject of disk drives, let me explode one myth. The new drives behave with all the sluggishness of the 1541 in C64 mode so don't expect any improved performance if you're thinking of plugging one into your old 64.

A bigger, better Basic has one apparent drawback. It takes up more memory than the earlier versions but this is counterbalanced by the fact that programs take up less space because the interminable PEEKs and POKEs of earlier versions have been replaced by short, sharp commands.

This is further enhanced by the banking system used. This has nothing to do with Nat West or Barclays but is the way in which several layers of memory are overlayed on the same memory locations and the computer selects which one it must use. This means that from power up almost 120K of memory is available to the user. In the 64 almost 26K of memory was reserved for Basic leaving only 38K for programs. Banking means that a more comprehensive Basic can be housed in an apparent 8K of memory!

The new Basic is yet another development of the original Microsoft Basic which means that any program written for Commodore machines from the early PET machines onwards will run on the 128 with one proviso. The limitation is that the internal architecture of the machines are so different that any PEEK, POKE or SYS commands will not work on the 128.

I've already mentioned that there are BASIC commands specifically for sound and graphics. These are supported by further keywords for helping with programming e.g. TRACE, TRON, DELETE. Plus more variations on FOR/NEXT loops such as DO/WHILE, DO/UNTIL BEGIN/BEND and IF/THEN/ELSE.

Thank goodness for the implementation of the PRINT USING command which puts an end to line upon line of string manipulations for laying out mathematical tables.

CP/M compatibility was first mooted with the appearance of the 64. It's feasibility was undermined by the limitations of the 40 column screen. With a built in Z80A and the 8563 video processor, the 128 is in a much better position to use the best of the available software. The only problem is the expense of some CP/M program's but the prices now seem to be dropping to meet the needs of a new generation of users.

CP/M 3.0 is a Disk Operating System (DOS) which was specifically written for handling disk files in a business environment. Before IBM took over this field with PC/DOS, CP/M was the first and only system of its kind. As you can imagine, this means that there is a mountain of software to support CP/M.

The one limitation is that all programs must require less than 59K of workspace. This is no major limitation because a lot of software was designed for 48K machines. The use of random access filing on disk means that the data can be pulled from disk to be worked on as and when it is required. In this way the effective storage space is expanded way beyond the apparent limitations of a 48K machine.

The DOS is also a programming language and user originated programs can be devised. The manual does not help greatly with this and the dedicated Commodore CP/M manual is not easy to understand. However, a search of a good computer book shop will turn up some of the gems which have been written in the past for those eager to understand this new environment. Be warned, this is a programmer's language and some aspects are very user unfriendly, often it is better to buy application software than to struggle through a program of your own.

For the 80-column mode RGBI display is best. Ordinary TV output is totally unsuitable and composite video can be as bad. Not that these options are available. If you select 80-column mode the output switches automatically to the RGBI socket.

Put simply, composite video means that the picture information is sent out as a single signal. From this coded message the monitor sorts out the red component from the blue and the green. This information is then relayed to the appropriate picture forming 'guns' deep inside the monitor and then on to the screen.

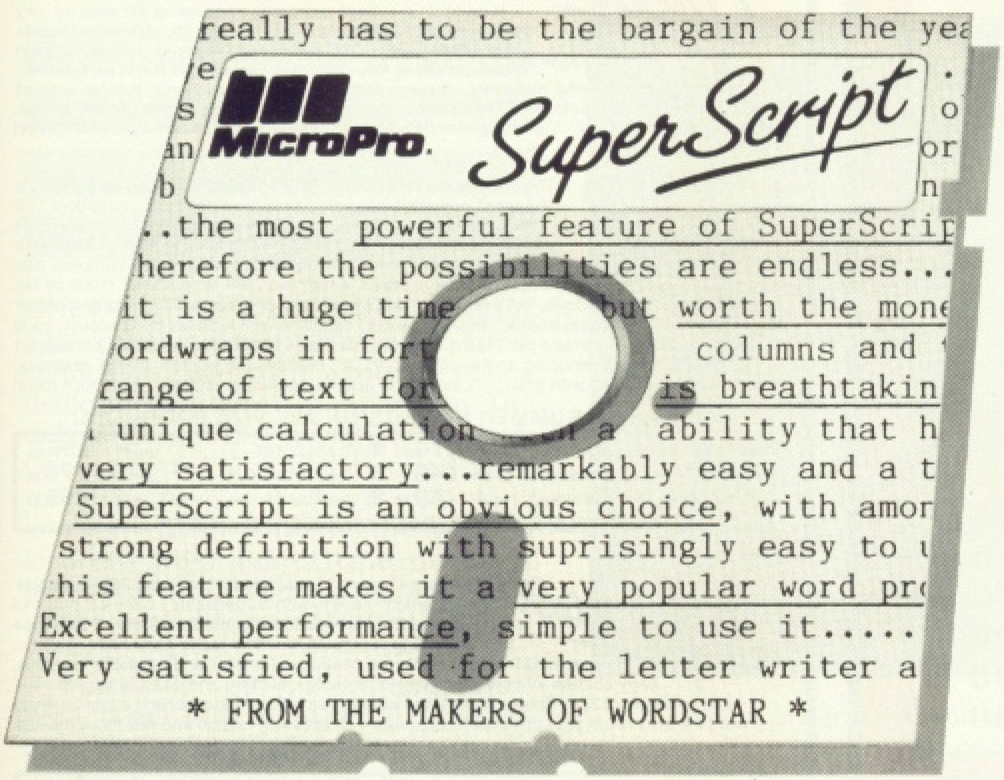
RF signals are simply composite signals mixed together with the sound output. Then the whole mixture is whacked up to a Radio Frequency to which the aerial socket on a TV will respond. The whole process is then reversed. The signal brought down to its original level, the sound sifted out and the colours separated. This obviously involves more stages than utilising a composite signal and the more stages the signal is put through, the more it is degraded.

RGBI on the other hand sends out its signal in the three colours separately (hence the RGB of its name). This means fewer stages are needed than was required for even the composite signal and therefore the image is sharper and clearer.

The disadvantage of a mixed RGBI 80-column mode and a composite 40-column mode is that it is awkward to switch from one mode to the other. Each screen works independently of the other and screen handling is complicated. Fortunately there is a way to display the big screen on a composite monitor and Robtek and Horasoft are marketing adaptors for around £13. They are just simple cross-over switches and the price you pay is the loss of colour in 80-column mode. DIY enthusiasts may be interested in the little diagram which shows the necessary wiring.

With the 128, Commodore has taken up a posture astride the twilight zone between home and business computing but with a firm footing on either side. With the computer industry uncertain which way computers will go, the 128 is a good way to hedge your bet.

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commodore 128

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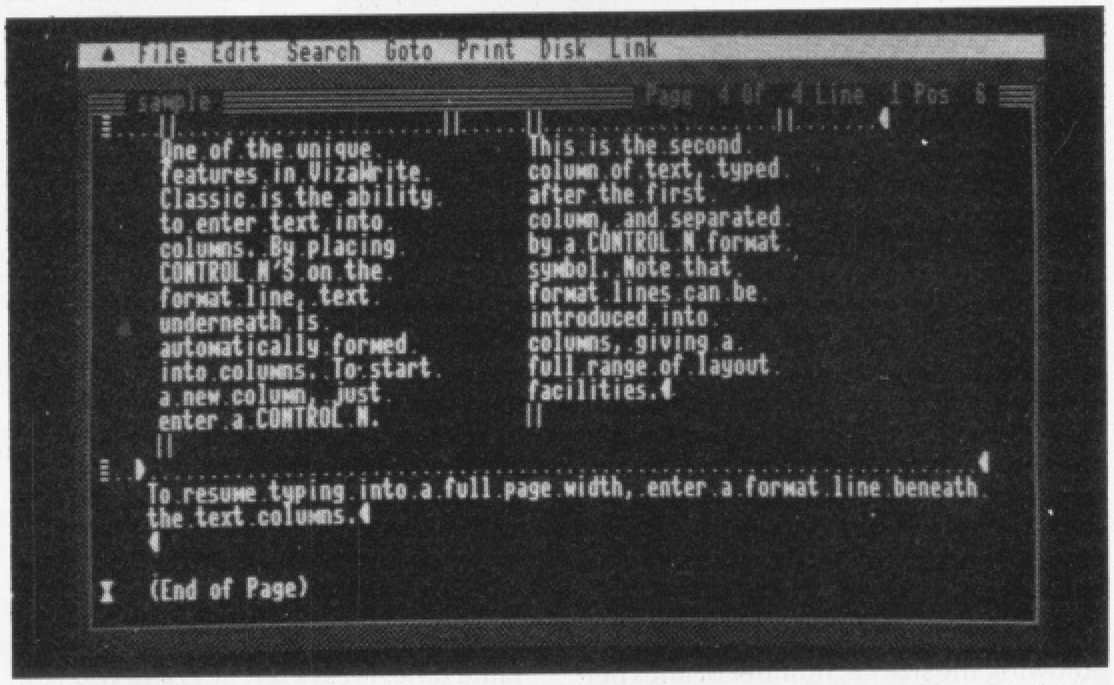
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C128 WORDPROCESSING

Stuart Cooke analyses three C128 wordprocessing packages and gives his recommendations.



ONE OF THE MAIN 'SERIOUS' USES OF a computer is as a wordprocessor. Some companies have made a fortune selling dedicated wordprocessing systems. The only difference between these and your Commodore 128 is that the dedicated machines have a wordprocessor built into the machine while the C128 must load one from disk or tape, obviously this makes the C128 much more versatile since you could use it for lots of different applications.

So exactly what is a wordprocessor? Well to put it in simple terms, a word-processor is just a glorified typewriter. Instead of typing your text, be it a letter or a chapter from a book, on to a piece of paper, you type it into your computer. Once your text is in your computer's memory you can read it through, correct any spellings, make any other alterations such as moving paragraphs around and eventually, when you're satisfied, print it out on to your computer printer.

Obviously the quality of your print-out depends upon the type of printer that you have attached to your C128. If you only have a very cheap dot-matrix printer you can't expect to get typewriter quality. If you have a high quality laser printer hooked up to your machine you can print pages that are as good as a printed page. In other words 'you get what you pay for'.

Obviously if you have a printer, a wordprocessor is a must, you can use it to write your latest novel or simply a thank you letter to an aunt at Christmas. If your handwriting is as bad as mine everyone else will probably be pleased that you bought a wordprocessor.

So what is available for the C128? Three companies have launched packages in Britain. These are Precision Software, with an updated version of *SuperScript* wordprocessor so that it works on the C128. Viza Software has launched *Visa Classic* again which is an update of an earlier C64 program. The third company is a newcomer to the English market, although extremely well known to the States, Timeworks is launching *Word Writer 128*.

All of the programs come complete with a spelling checker. Once your text has been written, run this option and the program will compare all words in the text against those held in its dictionary. Obviously they can't correct your spellings but they do highlight any words that they find unfamiliar so that you can check them in a normal dictionary. You can even add words to the dictionary so that the program will 'know' the words the next time they come up.

Viza Classic

Viza Classic can only be described as the 'prettiest' program of the bunch. It works only in 80 columns, so TV owners will not be able to use it without an interface, even so it would probably be very difficult to read the text.

The program disk is a 'flippy' (has programs on both sides) and has the wordprocessor on one side of the disk and the dictionary on the other. The disk is easily copied so you need not worry about having to use your master disk all of the time. *Viza Classic* is however still protected as it will not run without the necessary cartridge plugged into the back of the computer, and of course you only get one of these. This is the way that all expensive software should be. After all if you spill coffee on a £100 disk it is difficult to replace. If it is only a copy of the disk and the protection is elsewhere you are a lot better off since you can soon make another copy of the master disk.

When running, the program displays all of your text within a border and the available commands are accessed by a series of pull down menus across the top of the screen.

Many extremely useful options are available. For a start you can see at a glance exactly how many words, sentences and paragraphs you have entered. This is essential for journalists who must write to a certain length. Also available is a calculator which also has the ability to perform calculations on columns within the text.

You can use data from other programs such as Viza's own *Viza Classic* database and spread sheet or you can load in data from other wordprocessors. Basic programs obviously can't be loaded in to the wordprocessor since they are tokenised. If, however, you really want to wordprocess a program you can always list it to disk as a sequential file and then LOAD it in.

Listing programs leads me quite nicely into getting printouts from the wordprocessor. Within *Viza Classic* there are a number of options available to aid with the formatting of text. These range from underlining and centering text to indenting columns of text so that any tables are printed out neatly.

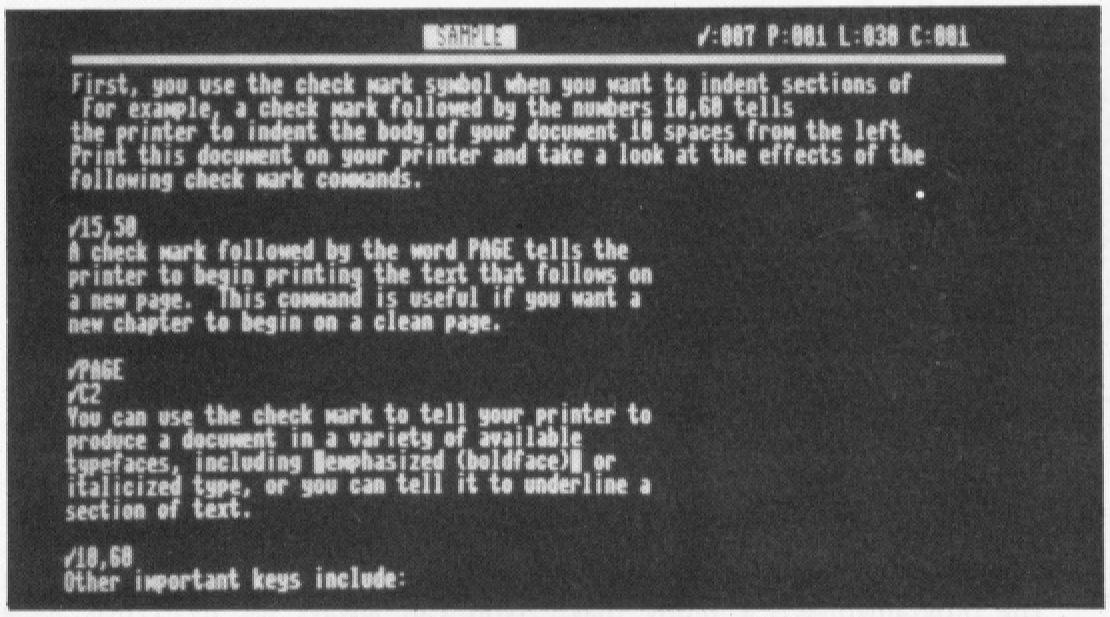
All these functions are accessed from a combination of the CONTROL key and a letter. This is where *Viza Classic* has one of its very few bad points. There is no indication on the screen as to what keys you should press to get at a specific function. If you can't remember, then two options are open to you, either

place your *Viza Classic* disk in the drive and press the help key. The help files will then be loaded from disk without affecting your text. The other option is to refer to your manual. Obviously you soon learn the commands that you use a lot but the ones that you don't often need have to be looked up.

When you come to the actual printout you have many options available to you. For a start you can define what sort of printer you are using so that the program knows which commands to send to the printer for a specific effect e.g. underline. You can say whether you want headers and footers, these have their own pages in memory so they can be a number of lines long. If you have a printer that can cope with graphics such as an Epson, Star or a Commodore MPS801 you even have the option of using one of three inbuilt, proportionally spaced, Near Letter Quality fonts.

You can force the program to make sure that paragraphs are not split over pages with the paginate command and you can change the width and length of the paper or the number of lines to a page etc.

One area in which I found the manual lacking was an explanation of the NLQ fonts. Ok, so it explained how to use them but I could have done with knowing the size i.e. number of lines per page and number of characters per column since I wasted a lot of paper before I got it right.



Obviously I don't have enough room here to mention all of the features of this wordprocessor and there are many that I haven't even launched upon, all I can really add is that even though it may seem a little pricey and I do have a few gripes it is a real joy to use and I wouldn't be without it.

Superscript

Unlike *Viza Classic, Superscript* allows you to use either 40 or 80 columns thus making it an ideal choice for C128 owners who are using either a TV or one of the older 40 column Commodore monitors.

As with Viza's program the available commands can be seen at the top of the screen, this time however all commands can be selected from here as well as by pressing keys. This means that you don't have to worry about remembering the commands as a quick look through the relevant menu will find it for you. As you would expect, there are numerous commands available to you. Again we have a maths function which will perform calculations within the document as well as the normal print format commands. If you normal print format commands. If you have ever used *Superscript* on the C64 or even the earlier *Easyscript* you will feel at home with *Superscript* since there is very little difference between the programs.

If you don't have a Commodore printer don't worry, as with the previous program you can set up the printer to suit your own requirements, including Centronics and RS232 printers.

Again the supplied disk is a flippy with the program on one side and the dictionary on the other. Unlike *Viza Classic* you can't copy the program though you can get a backup copy when you send off your registration form.

One extremely handy feature of this program is the ability to have both this program and Precision's data base program, *Superbase*, in memory at the same time. Press a few keys and you're in the relevant program. This is superb if you have a large address list, such as the one used by *Your Commodore*, as you can simply pull the relevant information, name, address etc., into your text file. Other programs do allow you to do this but having both programs in memory at the same time is a great time saver, not to mention very handy.

Superscript comes complete with an extremely hefty manual. Every bit of information that you could want is easily found from a very comprehensive index. Don't let the size put you off however as the program is very simple to use and the first few paragraphs are in the form of a very easy tutorial that will help to get you started.

Many people say that *Superscript* is the best wordprocessor for the C64. On the C128 it may not look as 'pretty' as *Viza Classic* but it does have points in its favour – for example, the 40 column mode and the fact that all commands are available from the menu. *Superscript* is a very easy to use and comprehensive program.

Word Writer 128

This program is similar to *Viza Classic* since all of the commands are selected from pull down menus. Since this package is far cheaper than the Viza one, a number of the 'extras' that are available with the more expensive package are missing. Even so this package is very easy to use and has all of the facilities that most people would want from a wordprocessor.

Unlike *Superscript, Word Writer 128* does expect you to select some of the commands by pressing keys rather than from the menu. However, a HELP file is always available to show you what these keys are. Unlike *Viza Classic* this file is resident with the program and doesn't need to access the disk.

It seems to have become the norm with C128 wordprocessors that all of them have an inbuilt calculator. Unlike the calculator in the other programs this one will not allow you to perform calculations on numbers in the text. Instead all calculations must be performed manually. The result of the last calculation can be copied into the document.

The version sent to the magazine for review was the American one complete with American dictionaries for the spelling checker. Don't let this worry you as the version that is going to be on sale here will come complete with an English dictionary.

As with both of the previous wordprocessors, provision is made for mailing list operations. This means that you can set up a file of names and addresses on disk and merge them in with a standard letter.

Files from Timework's spreadsheet program, *Swiftcalc 128*, can be merged into a document so that you can print out reports from any spreadsheets that you may use.

Information from Timework's database program *Data Manager* 128 can also be included within documents. You can even use an address file from your database as a mailing list for your letters.

Wordwriter is a very clear and easy to use program. It has all of the standard wordprocessor functions such as margin setting, line spacing alteration and changing the type style, but it does lack some of the more 'complex' features of the other two programs. If you're looking for a reasonably priced Wordprocessor that is easy to use then this may be ideal for you.

BEST of the REST

Stuart Cooke ties up loose ends in our C128 Roundup special.

EVEN THOUGH THE COMMODORE 128 is an excellent choice as a machine for a small business, it's not only business people who will buy it. It is an ideal machine for learning on or simply upgrading to from a C64. The advanced Basic in 128 mode is helpful to beginners and has been improved dramatically from the C64. Now it has graphics, sound and toolkit commands.

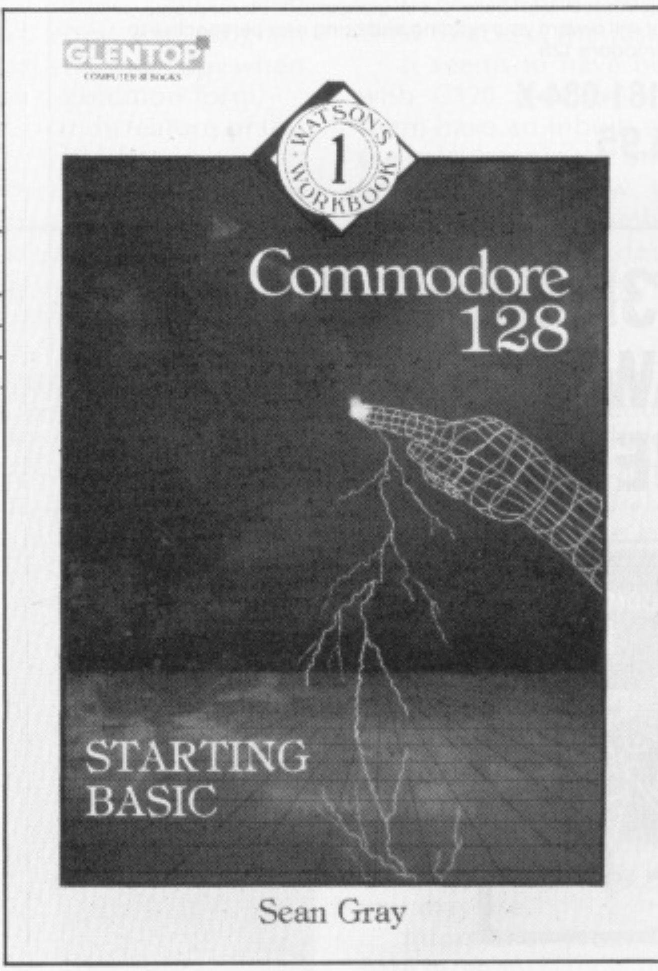
Obviously one of he best ways to learn about a computer is to read up on it, 128 users are extremely well catered for.

First Publishing, true to form, has produced a series of technical books, as they did for the C64 and have done for many other computers. Three books are available and it would be fair to say that no Commodore 128 owner should be without any of them. The three books in question are 'The Anatomy of the Commodore 128', which gives a complete breakdown of the Commodore 128's internal hardware at a very deep level. 'Hints and Tips for the C128' gives many handy hints as well as a large number of programs for your own use and finally 'The Anatomy of the 1571' gives a complete breakdown of the workings in Commodore's latest disk drive. The 1571 is built into the 128D. Beginers beware, these books are very technical and trying to read them knowing nothing about computers would probably put you off computing for life. On the other hand if you want to program your C128 you'll soon be referring to them as your Bible.

There are books available for beginners so you needn't worry if you're new to computers. 'Starting Basic, Commodore 128 book 1' is a useful little tome from Glentop Computer Books. It is principally a replacement for the Basic section of the 128 manual and is far superior to it. The book is full of programming examples and illustrations to help you on your way and is definitely recommended to anyone who wishes to learn about their machine.

SAMS has produced a couple of C128 books, they are both available in the UK from Pitman Publishing. The first book is the 'Official Book for the Commodore 128 Personal Computer' which, like Glentop's book is an introduction to the machine and how to use it, though it doesn't go very deeply into programming. The latest book 'Commodore 128 Reference Guide For Programmers' is quite a lot better. It is not, as its title would suggest, a technical book for programmers but, as with the Glentop, is more of a re-write of the manual. Even so, it is extremely well written and an ideal choice as a beginner's book, or even for an expert, as an invaluable reference guide, and it's so much better than the manual!

More advanced programmers will be pleased to find complete breakdowns of the machine's memory maps, including entry points to many useful machine code routines. I must say that it isn't as technical or as informative as the First Publishing books but is definitely a good all rounder.



All In Machine Code

At the recent Commodore Show I was asked if we had heard of any assemblers for the Commodore 128. At that time we hadn't come across any that were commercially available though we did print a superb assembler by Steve Carrie in the July 1986 issue of Your Commodore. Since then Commodore have launched an Assembler and Program Development System. This is a suite of programs available on disk for all Commodore machines, all on the same disk. Depending on the machine, different functions are available. For example, the C64 version has a monitor but since the C128 has one built into the machine there is no point in having another one. The Assembler offers nothing out of the ordinary but it does work well. If you are used to macros and other such fancy bits then I'm afraid that you may be a little disappointed.

Many of the functions available with the editor can also be used with Basic. For example moving the cursor to the top of the screen and pressing cursor up



will display the previous line of any listing on the screen, i.e. you now have bi-directional scrolling. A Search and Replace function is also avalable in Basic, one of the few that I have come across for Basic routines and extremely useful.

The manual is quite clear but if you have never touched machine code before then you will need to read up on it first because the manual doesn't try to teach you.

If you want an assembler for your 128 then this package is one that you shouldn't be without.

For those of you who want the speed of machine code but without the inconvenience of learning another language, First Publishing has come to your aid with their Basic Compiler: Basic 128.

Basic 128 is an updated version of their C64 compiler. It understands all of the C128 Basic commands and will turn most programs into machine code without too many problems. This package is extremely powerful and allows you to produce either integer programs for speed or floating point programs if you need to use a lot of numerical data in your program.

Basic 128 would be an excellent and welcome addition to any C128 software collection.

Late Arrival

Commodore has just released a suite of programs for the C128 for small businesses. The programs, called Micro Cler, comprise of a worldprocessor, database, spreadsheet, accounting package and lots more.

First impressions are extremely favourable, the program is fully integrated with many sections being in memory all of the time. You always have jotters available at the press of a function key, you can leave phone numbers or messages on these. A convenient diary function will allow you to keep track of appointments, birthdays etc. all at the touch of another button. All in all, Micro Clerk should make most of your other software obsolete.

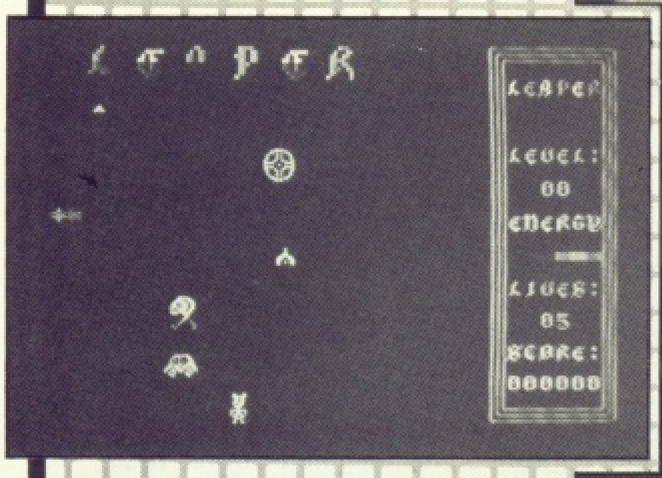
I don't think it would be unfair to say that this is the type of package that Commodore should give away with the C128 computer. Other manufacturers have done it and have reaped vast rewards thereby. For a full review of this unbeatable package you will have to wait until next month.

More?

In this small series of articles I have tried to mention all of the packages that we have seen in the Your Commodore office. I would hope that there are many more out there to fulfil the growing demand for software on this machine. If you do know of something or you are producing something do let us know about it, we would love to cover it in a future issue.

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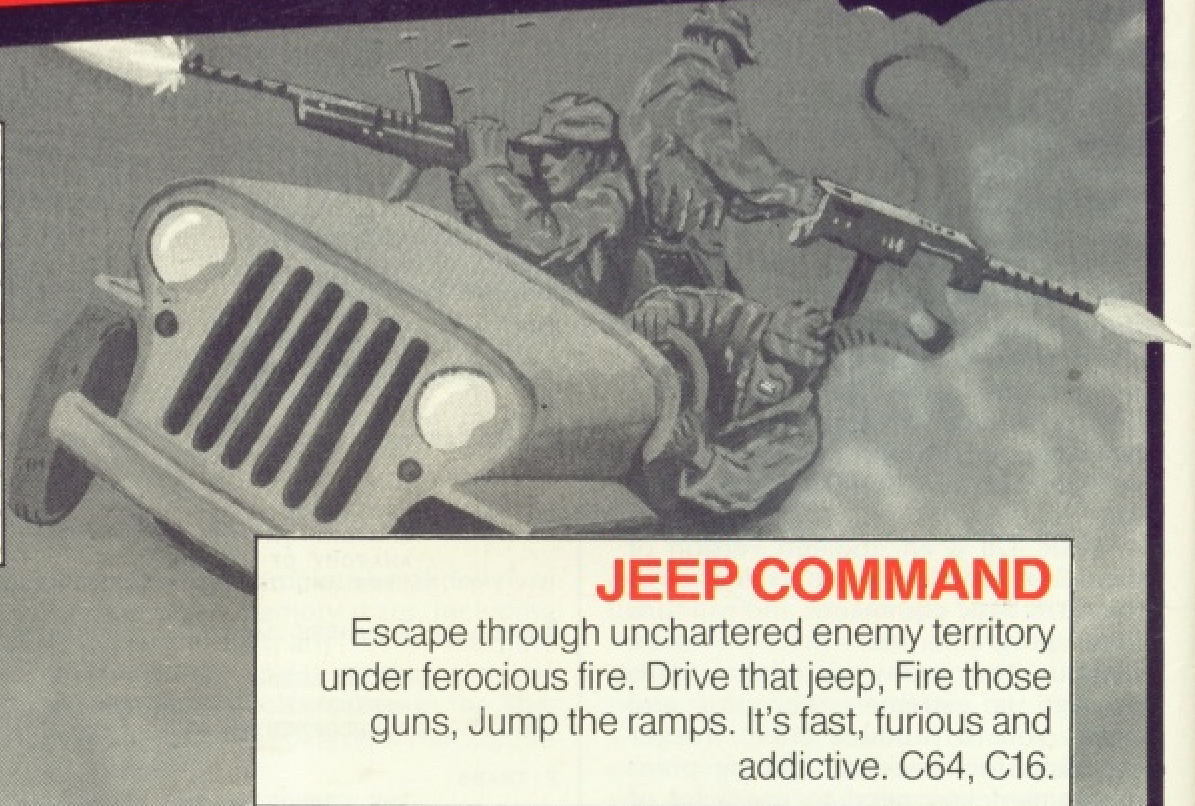


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BUG-BYTE





JEEP COMMAND

Escape through unchartered enemy territory under ferocious fire. Drive that jeep, Fire those guns, Jump the ramps. It's fast, furious and addictive. C64, C16.

£2.99

Argus Press Software Group, Victoria House, Leicester Place, London WC2H 7NB. 01-439 0666.
For mail-order and 'Byte-me' T-shirts (small, med, large: £3).

Allen Webb shows you how to reconfigure your C64.

On Location

ONCE YOU START DIGGING, it soon becomes apparent that the C64 is a highly versatile machine. The Vic chip is particularly cunning in its ability to address any part of RAM for the screen memory and character set.

Machine code users won't be too concerned about this but for Basic users, it's a godsend. The way in which the machine decides on the memory usage is quite simple.

Firstly, the RAM is split into four banks of 16K. The particular bank in use is specified by the lowest two bits of location 56576.

The position of the screen memory and character set within the current bank are specified by bits four to seven and bits one to three of location 53272, respectively. Within constraints, manipulation of these two locations allows you to change the configuration of the 64 to suit your needs.

Why Bother?

Why reconfigure the machine? The main reason is that you may want to use redefined characters. If you use Basic, however, you will want to maximise the memory available to Basic. The simple demonstrations in the Programmer's Reference Guide use the default bank with the characters starting at 12288 ($3000). This leaves you a pathetic 10K for Basic and minimal space for sprites. With a bit of thought, as I will show, you can have redefined characters with no loss of memory!

So where can we move the screen and character memories? The character memory requires 2K and the screen needs 1K. That means that in each bank there are eight positions for the character set and 16 positions for the screen. The limitations are as follows.

Bank 0 ($0000-$3FFF)

PROGRAM: RECONFIGURE

```
1 REM************************
2 REM* RECONFIGURE PROGRAM *
3 REM* GENERATOR AEW[SPC2]1986 *
4 REM************************
10 PRINT CHR$(147):POKE 53280,11
   :POKE 53281,0
20 PRINT"[DOWN6]"TAB(10)"[WHITE]CBM
   64 RECONFIGURE"
30 PRINT"[DOWN]"TAB(12)"A E WEBB[SPC2]
   1986"
40 INPUT"[DOWN3]WHAT OUTPUT DEVICE (DI
   SK=8, CASSETTE=1)";DE
50 PRINT CHR$(147):PRINT"[WHITE]WHAT
   FILE NAME IS THE RECONFIGURE[SPC7]
   PROGRAM TO";
60 INPUT " HAVE";FI$
70 PRINT CHR$(147)TAB(12)"SCREEN POSIT
   ION"
80 PRINT"[DOWN]THE AVAILABLE LOCATIONS
   ARE..."
90 PRINT"[YELLOW]BANK 0:[CYAN]"
100 PRINT"1024 ($0400)...DEFAULT VALUE"
110 PRINT"8192 ($2000) TO 15360 ($3C00
   )"
120 PRINT"[DOWN,YELLOW]BANK 1:[CYAN]"
130 PRINT"16384 ($4000) TO 31744 ($7C0
   0)"
140 PRINT"[DOWN,YELLOW]BANK 2:[CYAN]"
150 PRINT"32768 ($8000) TO 33792 ($840
   0)"
160 PRINT"[DOWN,YELLOW]BANK 3:[CYAN]"
170 PRINT"49152 ($C000) TO 52224 ($CC0
   0)"
180 PRINT"[DOWN,MAGENTA]IN INCREMENTS
   OF 1024 ($0400)
190 PRINT"[DOWN,WHITE]INPUT REQUIRED
   POSITION"
200 INPUT I$:IF LEFT$(I$,
   1)="$"AND LEN(I$)<>5 THEN 40
```

The machine uses this bank by default with the video memory at 1024 ($0400) and the character set image from 4096 to 8191 ($1000 to $1FFF).
1) You cannot use the zero page and page one since this will corrupt the operating system.
2) The use of this bank will generally severely limit your RAM for Basic and is therefore of little value. You could use a character set at 14336 ($3800) if you're prepared to live with only 12K for your program.
3) You may not use 4096 to 8191 ($1000 to $1FFF) for screen memory since this is the character set image.

Bank 1 ($4000-$7FFF)

You can use all of this bank but my earlier comments on reduced RAM apply.

Bank 2 ($8000-$BFFF)

1) There is a character set image between 36864 and 40959 ($9000 to $9FFF). This area may not be used for screen memory.
2) The Basic ROM occupies 40960 to 49151 ($A000 to $C000) precluding the use of this area for either screen or characters. It can, however, be used for high resolution graphics or sprite designs.

Bank 3 ($C000-$FFFF)

1) The area 49152 to 53247 ($C000 to $CFFF) may be used for screen memory and characters.
2) The area from 52448 ($D000) is occupied by the Kernal ROM and other chips and is of limited value. The ROM area ($E000 onwards) may be used for high resolution graphics or sprites only.

If you use banks 0, 1 or 2 you must remember to lower the top of memory to protect your screen or characters from corruption by Basic variables. If your screen or characters (whichever the lower) starts at address AD, you may protect them by the line:

POKE 56,AD/256: CLR

The area between the ROMS in bank 3 is the perfect area to use. This memory cannot be corrupted by Basic

```
210 GOSUB 760:SP=I
220 IF INT(SP/1024)<>SP/1024 THEN 70
230 PRINT CHR$(147)TAB(10)"CHARACTER
    POSITIONS"
240 PRINT"AVAILABLE LOCATIONS ARE...."
250 PRINT"[YELLOW]BANK 0:[CYAN]"
260 PRINT"2048 ($0800)"
270 PRINT"8192 ($2000) TO 14336 ($3800
  )"
280 PRINT"[DOWN,YELLOW]BANK 1:[CYAN]"
290 PRINT"16384 ($4000) TO 30720 ($780
   0)"
300 PRINT"[DOWN,YELLOW]BANK 2:[CYAN]"
310 PRINT"32768 ($8000) TO 34816 ($880
   0)"
320 PRINT"36864 ($9000) TO 38912 ($980
   0) ROM IMAGE"
330 PRINT"[YELLOW]BANK 3:[CYAN]"
340 PRINT"49152 ($C000) TO 51200 ($C80
   0)"
350 PRINT"[DOWN,MAGENTA]IN INCREMENTS
    OF $0800"
360 PRINT"[DOWN,WHITE]INPUT REQUIRED
    POSITION"
370 INPUT I$:IF LEFT$(I$,
   1)="$"AND LEN(I$)<>5 THEN 230
380 GOSUB 760:CP=I
390 IF INT(CP/2048)<>CP/2048 THEN 230
400 IF SP=CP THEN 70
410 IF INT(SP/16384)<>INT(CP/16384)THE
   N 70
420 FOR L=0 TO 0:CX=0:FOR D=0 TO 15
    :READ A:CX=CX+A:POKE 828+L*16+D,A
    :NEXT D
430 READ A:IF A<>CX THEN PRINT"ERROR
    IN LINE";2040+(L*10):STOP
440 NEXT L
450 DATA 160,0,185,1,192,153,1,8,200,
   192,187,208,245,96,0,255,2083
460 REM
470 FOR L=0 TO 11:CX=0:FOR D=0 TO 15
    :READ A:CX=CX+A:POKE 12*4096+1+L*16
   +D,A:NEXT D
480 READ A:IF A<>CX THEN PRINT"ERROR
    IN LINE";2040+(L*10):STOP
490 NEXT L
500 DATA 21,8,193,7,158,32,50,48,55,51,
   58,143,32,65,76,195,1192
510 DATA 32,87,69,66,66,0,0,0,173,158,
   8,172,159,8,133,253,1384
520 DATA 132,254,169,0,133,251,169,208,
   133,252,173,14,220,41,254,141,2544
```

LOCATION

```
530 DATA 14,220,165,1,41,251,133,1,160,
    0,177,251,145,253,24,165,2001
540 DATA 251,105,1,133,251,165,252,105,
    0,133,252,24,165,253,105,1,2196
550 DATA 133,253,165,254,105,0,133,254,
    165,252,201,216,208,220,165,1,2725
560 DATA 9,4,133,1,173,14,220,9,1,141,
    14,220,173,24,208,41,1385
570 DATA 240,13,163,8,41,15,13,161,8,
    141,24,208,173,162,8,141,1519
580 DATA 136,2,173,2,221,9,3,141,2,221,
    173,0,221,37,252,13,1606
590 DATA 160,8,141,0,221,169,164,160,8,
    32,30,171,96,0,192,0,1552
600 DATA 32,200,0,147,54,52,32,78,79,
    87,32,82,69,67,79,78,1168
610 DATA 70,73,71,85,82,69,68,0,0,255,
    0,255,0,255,219,83,1585
620 PA=SP/256:POKE 49314,PA
630 POKE 49311,CP/256: POKE 49310,
   CP-(PEEK(49311)*256)
640 BA=INT(SP/16384):POKE 49312,3-BA
650 SF=(SP-(BA*16384))/64:POKE 49313,SF
660 CF=(CP-(BA*16384))/1024
    :POKE 49315,CF
670 PRINT CHR$(147)"[WHITE]SCREEN AT
    :[SPC,YELLOW]"SP
680 PRINT"[WHITE]CHARACTERS AT[SPC,
   YELLOW]"CP
690 PRINT"FILENAME "FI$
700 PRINT"[DOWN,GREEN]IF YOU ARE SURE,
    MAKE CERTAIN THAT A[SPC4]DISK OR
    CASSETTE IS IN THE";
710 PRINT" OUTPUT DEVICEAND PRESS ANY
    KEY."
720 GET I$:IF I$=""THEN 720
730 PRINT CHR$(147)"[DOWN2]POKE45,185
    :POKE46,8:CLR:";
740 PRINT"SAVE"CHR$(34)FI$CHR$(34)","DE
750 PRINT"[HOME]";:POKE 198,1
    :POKE 631,13:SYS 828:END
760 I=0:IF LEFT$(I$,1)="$"THEN 780
770 I=VAL(I$):RETURN
780 I$=RIGHT$(I$,4)
790 FOR CH=1 TO 4:GOSUB 810
800 I=I+(V-1)*16↑(4-CH):NEXT:RETURN
810 V=1
820 IF MID$(I$,CH,1)=MID$("0123456789A
  BCDEF",V,1)THEN 840
830 V=V+1:GOTO 820
840 RETURN
```

and leaves you with all the Basic memory you have on power-up. If you want to be clever, since the normal screen memory is now unused, you can lower the start of Basic to 1025 ($0400) leaving you nearly 40K for Basic usage! If you want to use this area in bank 3, you can put the screen at:

$C000 (49152),
$C400 (50176),
$C800 (51200), or
$CA00 (52224)

and the characters at:

$C000 (49152), or
$CA00 (52224)

One extra warning, don't try to put the screen and character memories in the same place, it won't work properly!

The program

The listing generates a short program which will reconfigure the 64 for you. You tell it where you want the screen and character memories and it generates a short machine code program and automatically saves it to disk or cassette. The creation of the program involves destroying the original program so make sure that you:

1) Type it in exactly as listed.
2) Don't try to stop it during its execution.

To reconfigure your machine, simply load the machine code routine and RUN it. If you list it, you will see that it has just one line of Basic. Once the machine is reconfigured, you will get a reassuring message on the screen.

What the program actually does is:
1) Copies the normal (uppercase) character set to the new character area, and
2) Resets the bank and memory areas as required.

The program contains some prompting to help you remember what is allowed, and it will prevent the more fundamental blunders. Nor will it stop you from using an illegal area of memory so be careful.

CROSSWORD

Tax your grey matter with this program from M R Gillings

IF YOU ARE FED UP OF blasting aliens, don't want to try to solve another adventure and would like to have a go at something different, how about a crossword?

This program comes complete with a suite of four crosswords for you to try and solve. In a future issue we will be printing more crosswords and giving details of how to enter your own.

Crossword displays a standard grid on the screen and each clue is scrolled across the bottom with space beneath to enter the answer.

The function keys are used to select the question that is being displayed. Their functions are as follows:

F1 – Reset to first across clue.
F3 – Reset to first down clue.
F5 – Finish, Save or another grid.
F7 – Displays next clue without entering current answer on to grid.
RETURN – Enter answer on to grid and display next clue.

Getting It All In

Crossword is presented as a set of two Basic loaders. The first set, 'CROSS LOAD' will set up and save a machine code program called CROSSWORD on to tape or disk. This is the program that you should always RUN when you want to use the program.

Before you RUN the CROSS LOAD programs you should enter the following command:

POKE 43,∅:POKE 44,30:.POKE 7679,0:NEW

This will move Basic so that the CROSSWORD program will be generated correctly.

The second set of loaders, 'ICROSS LOAD' will set up the questions on either disk or tape. Before you RUN this set of programs switch your machine OFF and ON. When RUN, this set of loaders will create a file called 'ICROSS' on disk or tape. You will not be able to list this program as it is just data for the crossword.

Before LOADing the 1CROSS LOAD 1 program enter the following line POKE 43,0:POKE44,107:POKE 27391, 0:NEW

NOTE: If using cassette make sure that all of the loaders are saved in order, as each section of program when finished will LOAD the next and automatically RUN it.

Using the Program

To use the program, simply LOAD the program 'CROSSWORD' and RUN it. The initial screen will show the controls and ask for the 'Data Filename'. This is the name of the data file which you have created. At the moment this is 'ICROSS'. After loading you will be asked for which of the four crosswords that you wish to use.

Next Month

Because of the length of this article we are printing the CROSSWORD LOAD program this month and the rest of the 1CROSS LOAD programs in next months issue.

If you purchase this months cassette or disk from our software service all parts of the program will be on it.

Crossload 1

```
2000 FORL=0TO340:CX=0:FORD=0
TO15:READA:CX=CX+A:POKE2049+
L*16+D,A:NEXTD
2010 READA:IFA<>CXTHENPRINT"
ERROR IN LINE";2040+(L*10):S
TOP
2020 NEXTL
2040 DATA11,8,1,0,158,50,50,
48,56,0,36,8,2,0,133,34,595
2050 DATA147,68,65,84,65,32,
70,73,76,69,78,65,77,69,34,5
9,1131
2060 DATA65,36,0,48,8,3,0,14
7,65,36,44,49,44,49,0,0,594
2070 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2080 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2090 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2100 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2110 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2120 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
2130 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,76,76
2140 DATA16,27,210,255,169,0
,141,32,208,141,33,208,141,1
6,208,141,1946
2150 DATA21,208,169,1,141,27
,208,169,1,160,0,153,0,216,1
53,0,1627
2160 DATA217,153,0,218,153,0
,219,200,208,241,160,0,162,0
,32,210,2173
2170 DATA15,234,234,234,160,
240,185,223,25,153,159,4,136
,208,247,160,2617
2180 DATA23,185,199,25,153,2
32,5,136,208,247,160,20,185,
175,25,153,2131
2190 DATA57,6,136,208,247,16
9,49,141,182,6,169,50,141,18
6,6,169,1922
2200 DATA51,141,190,6,169,52
,141,194,6,32,41,9,201,49,20
8,3,1493
2210 DATA76,96,9,201,50,208,
3,76,160,9,201,51,208,3,76,1
70,1597
2220 DATA9,201,52,208,228,76
,180,9,169,0,133,198,72,152,
72,138,1897
2230 DATA72,162,80,160,80,13
6,208,253,202,208,248,32,228
,255,141,92,2557
2240 DATA9,104,170,104,168,1
04,173,92,9,240,221,96,234,2
34,234,16,2208
2250 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,141,141
2260 DATA81,9,169,54,133,252
,169,0,133,251,169,41,133,25
4,169,0,2017
2270 DATA133,253,160,0,162,9
,177,251,145,253,200,208,249
,230,252,230,2912
2280 DATA254,232,224,22,208,
240,173,81,9,56,233,49,10,16
8,162,0,2121
2290 DATA185,16,42,157,86,10
,200,232,224,2,208,244,76,19
2,9,141,2024
2300 DATA81,9,169,67,133,252
,76,103,9,141,81,9,169,80,13
3,252,1764
2310 DATA76,103,9,141,81,9,1
69,93,133,252,76,103,9,234,2
34,160,1882
2320 DATA30,185,143,25,153,1
51,7,136,208,247,32,41,9,201
,78,208,1854
2330 DATA3,76,249,10,201,89,
208,242,160,10,185,127,25,15
3,151,7,1896
2340 DATA136,208,247,160,24,
185,63,23,153,161,7,136,208,
247,32,41,2031
2350 DATA9,201,68,208,3,76,8
8,10,201,84,208,242,160,40,1
85,87,1870
2360 DATA23,153,151,7,136,20
8,247,160,4,185,127,25,153,1
82,7,136,1904
2370 DATA208,247,32,41,9,32,
64,10,169,4,141,32,208,141,3
3,208,1579
2380 DATA169,0,162,1,160,0,3
2,186,255,169,6,162,82,160,1
0,32,1586
2390 DATA189,255,169,0,162,0
,160,24,32,213,255,76,249,10
,234,169,2197
2400 DATA147,32,210,255,160,
5,169,17,32,210,255,136,208,
250,96,64,2246
2410 DATA58,83,65,86,69,48,4
9,160,32,185,127,23,153,151,
7,136,1432
2420 DATA208,247,160,4,185,1
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27,25,153,177,7,136,208,247,
32,41,9,1966
2430 DATA32,64,10,169,4,141,
32,208,141,33,208,169,0,162,
8,160,1541
2440 DATA0,76,39,10,169,82,1
41,229,10,169,80,141,227,10,
76,156,1615
2450 DATA10,169,80,141,229,1
0,169,82,141,227,10,162,0,23
6,127,43,1836
2460 DATA208,1,96,138,168,18
5,208,43,141,91,9,185,80,43,
133,82,1811
2470 DATA169,24,133,83,138,1
0,168,185,128,43,133,80,185,
129,43,133,1784
2480 DATA81,236,126,43,16,12
,169,1,141,223,10,32,224,10,
232,76,1632
2490 DATA158,10,169,79,141,2
23,10,32,224,10,232,76,158,1
0,1,160,1693
2500 DATA0,177,80,145,82,165
,80,24,109,223,10,133,80,144
,2,230,1684
2510 DATA81,200,204,91,9,208
,234,96,169,147,32,210,255,1
69,1,141,2247
2520 DATA32,208,141,33,208,1
60,128,185,255,24,153,63,3,1
36,208,247,2184
2530 DATA169,0,141,95,9,160,
0,169,0,153,0,216,153,0,217,
153,1635
2540 DATA0,218,153,0,219,185
,0,44,153,0,4,185,0,45,153,0
,1359
2550 DATA5,185,0,46,153,0,6,
185,0,47,153,0,7,200,208,215
,1410
2560 DATA160,40,169,1,153,11
1,219,136,208,250,32,146,10,
76,186,13,1910
2570 DATA160,0,32,103,11,24,
165,85,105,8,133,85,144,2,23
0,86,1373
2580 DATA200,192,40,208,237,
96,132,87,169,32,133,252,24,
177,253,10,2242
2590 DATA144,3,32,146,11,10,
144,3,32,148,11,10,144,3,32,
150,1023
2600 DATA11,133,251,160,0,17
7,251,145,85,200,192,8,208,2
47,164,87,2319
2610 DATA96,230,252,230,252,
230,252,96,162,0,160,0,32,24
7,11,32,2282
2620 DATA6,12,32,16,12,232,2
24,40,208,245,162,0,160,0,32
,41,1422
2630 DATA12,32,58,12,32,16,1
2,232,224,40,208,245,162,0,1
60,0,1445
2640 DATA32,63,12,32,6,12,32
,16,12,232,224,40,208,245,16
2,0,1328
2650 DATA160,0,32,79,12,32,8
8,12,32,27,12,232,224,40,208
,245,1435
2660 DATA230,88,165,88,201,8
,208,1,96,160,80,162,80,202,
208,253,2230
2670 DATA136,208,248,76,153,
11,169,128,133,251,169,129,1
33,253,169,35,2401
2680 DATA133,252,133,254,96,
177,253,145,251,200,192,7,20
8,247,96,165,2809
2690 DATA253,24,105,8,133,25
3,144,2,230,254,165,251,24,1
05,8,133,2092
2700 DATA251,144,2,230,252,1
60,0,96,169,135,133,251,169,
35,133,252,2412
2710 DATA169,0,133,253,169,3
7,133,254,96,177,253,145,251
,96,169,0,2335
2720 DATA133,251,169,1,133,2
53,169,37,133,252,133,254,96
,234,169,7,2424
2730 DATA133,251,169,37,133,
252,96,169,0,145,251,96,32,4
1,9,201,2015
2740 DATA133,208,3,76,228,13
,201,134,208,3,76,241,13,201
,135,208,2081
2750 DATA3,76,112,14,201,136
,208,3,76,160,13,76,195,12,2
34,160,1679
2760 DATA11,185,191,22,153,1
51,7,136,208,247,172,95,9,18
5,208,43,2023
2770 DATA168,140,94,9,169,10
2,153,203,7,136,208,250,172,
95,9,185,2100
2780 DATA80,43,133,75,169,24
,133,76,160,0,177,75,153,164
,7,200,1669
2790 DATA204,94,9,208,245,16
0,0,169,30,153,204,7,169,5,1
53,204,2014
2800 DATA219,96,173,92,9,201
,29,208,3,76,215,12,201,157,
208,3,1902
2810 DATA76,245,12,76,8,13,1
69,102,153,204,7,169,0,153,2
04,219,1810
2820 DATA200,204,94,9,208,1,
136,169,30,153,204,7,169,5,1
53,204,1946
2830 DATA219,76,93,12,169,10
2,153,204,7,169,0,153,204,21
9,136,16,1932
2840 DATA1,200,76,232,12,234
,234,140,93,9,173,92,9,201,1
3,208,1.27
2850 DATA3,76,57,13,201,32,2
40,23,173,92,9,201,91,48,3,7
6,1338
2860 DATA93,12,201,65,16,3,7
6,93,12,173,92,9,56,233,64,1
72,1370
2870 DATA93,9,153,164,7,76,2
15,12,173,95,9,10,168,185,12
8,43,1540
2880 DATA133,89,185,129,43,1
33,90,173,95,9,205,126,43,16
,37,169,1675
2890 DATA1,141,88,13,76,89,1
3,1,160,0,185,164,7,145,89,2
00,1372
2900 DATA204,94,9,240,23,165
,89,24,109,88,13,133,89,144,
2,230,1656
2910 DATA90,76,91,13,169,79,
141,88,13,76,89,13,160,24,16
9,32,1323
2920 DATA153,151,7,153,191,7
,169,0,153,151,219,153,191,2
19,136,208,2261
2930 DATA237,32,133,10,76,16
0,13,234,234,234,234,234,234
,234,234,32,2565
2940 DATA90,14,238,95,9,173,
95,9,205,127,43,208,5,169,0,
141,1621
2950 DATA95,9,169,0,133,88,3
2,32,29,173,95,9,10,168,185,
64,1291
2960 DATA42,133,253,185,65,4
2,133,254,169,0,133,85,169,3
7,133,86,1919
2970 DATA32,81,11,169,0,133,
88,32,153,11,32,0,14,32,128,
12,928
2980 DATA76,93,12,32,90,14,1
69,0,141,95,9,133,88,76,183,
13,1224
2990 DATA32,90,14,173,126,43
,141,95,9,76,179,13,234,234,
234,172,1865
3000 DATA95,9,185,160,42,141
,16,208,169,0,141,21,208,173
,95,9,1672
3010 DATA10,168,185,0,43,141
,0,208,185,1,43,141,1,208,17
2,95,1601
3020 DATA9,185,208,42,141,24
8,7,169,1,141,21,208,162,0,1
42,63,1747
3030 DATA14,120,169,64,141,2
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3040 DATA80,9,208,18,169,16,
141,80,9,174,63,14,232,138,4
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3050 DATA141,63,14,141,39,20
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3060 DATA234,141,21,3,88,169
,0,141,21,208,141,16,208,96,
0,32,1519
3070 DATA90,14,169,0,133,88,
32,153,11,160,255,162,0,185,
255,23,1730
3080 DATA217.255,40,240,6,13
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3090 DATA111,14,224,255,208,
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234,234,169,2666
3100 DATA208,133,253,169,22,
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133,86,32,2016
3110 DATA81,11,169,0,133,88,
32,153,11,160,32,169,32,153,
191,7,1422
3120 DATA185,247,22,153,151.
7,136,208,242,32,41,9,201,89
,208,3,1934
3130 DATA76,56,15,201,78,208
,242,169,0,133,88,32,153.11,
160,32,1654
3140 DATA185,23,23,153,151,7
,136,208,247,32,41,9,234,234
,234,234,2151
3150 DATA234,201,89,208,3,76
,0,15,201,78,208,237,0,0,0,1
60,1710
3160 DATA32,185,199,23,153,1
51,7,136,208,247,32,41,9,234
,234,234,2125
3170 DATA234,234,201,82,208,
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0,255,169,2409
3180 DATA32,153,255,23,136,2
08,250,169,0,141,95,9,76,208
,26,169,1950
3190 DATA0,141,95,9,76,249,1
0,169,0,133,88,32,153,11,160
,32,1358
3200 DATA185,55,23,153,151,7
,136,208,247,32,41,9,201,68,
208,3,1727
3210 DATA76,143,15,201,84,20
8,242,160,40,185,87,23,153,1
51,7,136,1911
3220 DATA208,247,32,41,9,32,
64,10,169,0,162,1,160,255,32
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,186,1608
3230 DATA255,169,6,162,82,16
0,10,32,189,255,169,0,133,25
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3240 DATA133,252,169,251,162
,255,160,24,32,216,255,76,22
3,14,160,32,2414
3250 DATA185,127,23,153,151,
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3260 DATA0,162,8,160,255,32,
186,255,169,8,162,80,160,10,
32,189,1868
3270 DATA255,76,123,15,169,1
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3280 DATA169,37,133,86,32,81
,11,169,0,133,88,32,153,11,7
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3290 DATA14,169,0,133,251,13
3,253,169,16,133,252,169,32,
133,254,177,2288
3300 DATA251,145,253,200,208
,249,230,252,230,254,232,224
,7,208,240,173,3356
3310 DATA24,208,41,240,9,8,1
41,24,208,96,234,234,234,234
,234,60,2229
3320 DATA102,110,110,96,98,6
0,0,24,60,102,126,102,102,10
2,0,124,1318
3330 DATA102,102,124,102,102
,124,0,60,102,96,96,96,102,6
0,0,120,1388
3340 DATA108,102,102,102,108
,120,0,126,96,96,120,96,96,1
26,0,126,1524
3350 DATA96,96,120,96,96,96,
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3360 DATA102,102,126,102,102
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3390 DATA118,126,126,110,102
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,0,102,1343
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0,126,1014
3450 DATA6,12,24,48,96,126,0
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3460 DATA18,48,124,48,98,252
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3470 DATA24,60,126,24,24,24,
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,98,102,12,24,48,102,70,0,60
,888
3510 DATA102,60,56,103,102,6
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3520 DATA24,48,48,48,24,12,0
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3530 DATA102,60,255,60,102,0
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01
3540 DATA0,0,0,0,24,24,48,0,
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3550 DATA0,0,0,0,24,24,0,0,3
,6,12,24,48,96,0,60,297
3560 DATA102,110,118,102,102
,60,0,24,24,56,24,24,24,126,
0,60,956
3570 DATA102,6,12,48,96,126,
0,60,102,6,28,6,102,60,0,6,7
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3580 DATA14,30,102,127,6,6,0
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3590 DATA102,96,124,102,102,
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3650 DATA0,0,255,255,0,0,0,0
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3690 DATA255,255,255,255,255
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,248,248,248,24,3793
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3970 DATA0,0,0,0,0,0,0,0,0,0
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3990 DATA0,0,0,0,0,0,0,0,0,0
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4200 DATA0,0,0,0,0,0,0,0,0,0
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4280 DATA0,0,0,0,0,0,0,0,0,0
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4290 DATA0,0,0,0,0,0,0,0,0,0
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4310 DATA0,0,0,0,0,0,0,0,0,0
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4340 DATA0,0,0,0,0,0,0,0,0,0
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4350 DATA0,0,0,0,0,0,0,0,0,0
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4360 DATA0,0,0,0,0,0,0,0,0,0
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4370 DATA0,0,0,0,0,0,0,0,0,0
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4380 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0
4390 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,5,5
4400 DATA14,20,5,18,32,23,15
,18,4,58,0,0,0,0,0,25,232
4410 DATA15,21,32,8,1,22,5,3
2,14,15,20,32,3,15,13,16,264
4420 DATA12,5,20,5,4,32,20,8
,5,32,3,18,15,19,19,23,240
4430 DATA15,18,4,46,32,32,32
,4,15,32,25,15,21,32,23,1,34
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4440 DATA14,20,32,20,15,32,1
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4450 DATA1,20,20,5,13,16,20,
23,15,21,12,4,32,25,15,21,26
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4460 DATA32,12,9,11,5,32,20,
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4470 DATA1,9,14,63,32,32,32,
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4490 DATA15,18,32,20,29,32,3
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4500 DATA5,3,20,12,25,32,19,
5,20,63,32,1,14,25,32,11,319
4510 DATA5,25,32,20,15,32,19
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4520 DATA15,18,18,5,3,20,32,
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4530 DATA25,32,11,5,25,32,20
,15,32,19,1,22,5,32,32,42,35
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4540 DATA42,3,15,14,7,18,1,2
0,21,12,1,20,9,15,14,19,231
4550 DATA42,42,32,3,18,15,19
,19,23,15,18,4,32,3,15,13,31
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4560 DATA16,12,5,20,5,46,32,
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4570 DATA13,5,32,15,18,32,14
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4580 DATA18,32,15,18,32,14,2
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4590 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,32,32
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4610 DATA32,32,32,32,32,32,3
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4620 DATA32,32,32,32,32,32,3
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4650 DATA32,32,32,32,32,32,3
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4660 DATA32,32,32,32,32,32,3
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4670 DATA32,32,32,32,32,32,3
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,512
4680 DATA32,32,32,32,32,32,3
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4690 DATA32,32,32,32,32,32,3
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4700 DATA32,32,32,32,32,32,3
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4710 DATA32,32,32,32,32,32,3
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4720 DATA32,32,32,32,32,32,3
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4730 DATA32,32,32,32,32,32,3
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4740 DATA32,32,32,32,32,32,3
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,512
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,125,248,0,56,16,0,84,32,749
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,0,0,0,0,0,0,0
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4820 DATA56,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,56
4830 DATA0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,12,12
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,22,5,4,32,1,20,20,5,214
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,32,32,23,15,21,12,4,32,32,3
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4900 DATA65,67,67,67,67,67,6
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,1070
4910 DATA67,67,67,67,67,67,6
7,67,67,67,67,67,67,67,67,67
,1072
4920 DATA67,67,67,67,67,67,7
1,32,76,107,91,74,107,74,74,
78,1186
4930 DATA107,77,74,78,107,77
,74,82,107,91,74,107,74,107,
107,107,1450
4940 DATA74,107,77,74,78,107
,74,74,78,107,74,74,78,107,8
4,32,1299
4950 DATA76,85,88,107,107,74
,107,74,107,74,107,74,107,74
,83,107,1451
4960 DATA85,94,78,107,74,107
,107,107,74,107,74,107,74,10
7,74,107,1483
4970 DATA74,107,74,86,74,107
,84,32,76,85,94,107,107,74,7
4,87,1342
4980 DATA107,74,107,74,107,8
6,81,82,107,92,74,107,74,78,
74,77,1401
4990 DATA74,107,74,107,74,10
7,74,74,87,107,74,77,74,107,
84,32,1333
5000 DATA76,107,81,74,107,74
,86,94,107,86,74,87,107,74,8
8,107,1429
5010 DATA85,74,87,107,86,74,
92,74,87,107,86,74,87,107,74
,86,1387
5020 DATA94,107,74,74,87,107
,84,32,97,98,98,98,98,98,98,
98,1442
5030 DATA98,98,98,98,98,98,9
8,98,98,98,98,98,98,98,98,98
,1568
5040 DATA98,98,98,98,98,98,9
8,98,98,98,98,98,98,98,101,1
60,1633
5050 DATA32,185,239,26,153,1
51,7,136,208,247,32,41,9,201
,78,208,1953
5060 DATA3,76,160,8,201,89,2
08,242,96,0,0,0,0,0,0,12,109
5
5070 DATA15,1,4,32,9,14,32,1
4,5,23,32,4,1,20,1,63,270
5080 DATA32,27,25,32,15,18,3
2,14,29,32,32,32,32,32,32,16
9,585
5090 DATA147,32,210,255,169,
0,141,32,208,141,33,208,160,
0,169,1,1906
5100 DATA153,0,216,153,0,217
,153,0,218,153,0,219,200,208
,241,169,2300
5110 DATA23,141,24,208,160,3
7,185,167,27,153,160,4,185,2
04,27,153,1858
5120 DATA203,4,185,6,28,153,
64,5,185,171,28,153,171,6,13
6,208,1706
5130 DATA229,160,32,185,75,2
8,153,184,5,185,107,28,153,1
1,6,185,1726
```

```
5140 DATA139,28,153,91,6,185
,43,28,153,107,5,185,250,28,
153,46,1600
5150 DATA4,136,208,223,160,2
1,185,229,28,153,117,7,185,2
41,27,153,2077
5160 DATA243,4,185,208,28,15
3,251,6,136,208,235,32.41,9,
169,147,2055
5170 DATA32,210,255,169,21,1
41,24,208,160,3,185,164,27,1
53,159,8,1919
5180 DATA136,208,247,96,169,
147,32,49,46,32,84,72,73,83,
32,80,1586
5190 DATA82,79,71,82,65,77.3
2,67,79,77,69,83,32,67,79,77
,1118
5200 DATA80,76,69,84,69,32,8
7,73,84,72,32,52,67,82,79,83
,1121
5210 DATA83,87,79,82,68,83,3
2,65,78,68,32,65,32,83,65,86
,1088
5220 DATA69.47,76,79,65.68.3
2,70,65,67,73,76,73,84,89,32
,1065
5230 DATA32.84,79,32.68.73.8
3,75,32,65.78,68,32.84,65,80
,1030
5240 DATA69.46.32.32.32.32.5
0,46.32,87.72,69,78.32,82,69
,860
5250 DATA81,85,69,83.84,69.6
8,32,70,79.82.32,68.65,84,65
,1116
5260 DATA32,70,73,76,69,78.6
5,77,69.32.32,69,78.84,69,82
,1055
5270 DATA32,177,195,210.207.
211,211,32,65,78,68.32,210,1
97,212,213.2350
5280 DATA210,206,32.75,69,89
,46,32,32,32.32.51.46,32,84.
72,1140
5290 DATA69,82,69,32,65,82.6
9,32,70,79,85,82.32,67,79,78
,1072
5300 DATA84,82,79,76.32,75,6
9,89,83,46,32.134,177,32,45,
32,1167
5310 DATA82,69,83,69,84,32,8
4,79,32,70,73,82,83,84,32,65
,1103
5320 DATA67.82,79,83,83,32.6
7,76,85,69,46.134,179,32,45,
32,1191
5330 DATA82,69,83,69.84,32,8
4,79,32,70,73.82,83,84,32,68
,1106
5340 DATA79,87,78,32,67,76.8
5,69,46.32,32,134,181,32,45,
32,1107
5350 DATA70.73,78,73,83,72,4
4,83,65.86,69,32,79,82.32,65
,1086
5360 DATA78.79,84,72.69,82,3
2,71,82,73,68,46,32.32,32,32
,964
5370 DATA134,183,32,45,32,78
,69,88,84,32,67,76,85,69,46,
32,1152
5380 DATA32,32,32,32,32,65,7
8,89,32,75,69,89.32,84,79,32
,884
5390 DATA76,79,65.68,32,68,6
5.84,65.46,67,82,79,83,83,87
,1129
5400 DATA79,82,68,32,66,89,3
2,77,46,82,46,71,73,76,76,73
,1068
5410 DATA78,71,83,46,32,32.3
2,32,32,32,32,32,32,32,32,16
0,790
5420 DATA24,169,32,153,151,7
,153,191,7,169,0,153,151,219
,153,191,1923
5430 DATA219,136,208,237,76,
153,11,234,234,234,234.234.2
34,234,234,0,2912
5440 DATA0,0,0,0,0,0,0,0,0.0
,0,0,0,0,0,0,0
5500 REM CHANGE FOR DISK
5510 PRINT"(DOWN)(DOWN) ARE
YOU USING DISK OR TAPE (D/T)
";
5520 GET K$:IF K$<>"D"ANDK$<
>"T" THEN 5520
5530 IF K$="D" THEN POKE2092
,56
6000 REM######NOW READY TO S
AVE#######
6010 PRINT "(DOWN)(DOWN)(DOW
N)(DOWN)PRESS ANY KEY TO SAV
E"
6020 GET K$:IFK$=""THEN6020
6030 POKE43,1:POKE44,8:POKE4
5,80:POKE46,29:SAVE "CROSSWO
RD",1,1
6040 REM CHANGE ,1,1 IN ABOV
E LINE TO ,8,1 FOR DISK USE
```

ALL CLEAR

William Fong

provides some unusual ways of clearing your screen.

PROFESSIONAL PROGRAMS always have the edge on those that you write for yourself at home. Even something as simple as a screen clear can look so much better. Text may split into two and scroll off into the margins. Text may scroll of the top off the screen. In fact the number of different ways that the screen is cleared is quite amazing.

Now you can add these professional touches to your own programs with a series of routines that are called by a simple SYS call. There are 23 different screen clear routines in this package ranging from a simple right scroll to one that I call Shake Quarter Split screen scroll.

Getting It All In

Typing in the program should give no problems. It is presented in the form of a Basic loader with a check on every line to make sure that you have entered it correctly. Once you RUN the Basic loader it will generate a Machine Code file called 'ALL CLEAR' and save it on to a disk. If you are using tape make sure to change the ,8 in the SAVE instruction to a ,1 as indicated in the REM line above.

Using the Program

Whenever you wish to use ALL CLEAR in your programs you simply have to LOAD it into your C64 with one of the following commands:

LOAD "ALL CLEAR",8,1 for disk
or
LOAD "ALL CLEAR",1,1 for tape.

Below you will find a list of all of the SYS calls and the type of clear that they perform, some I couldn't even think of a name for. To use a routine simply type SYS followed by the number.

As example program is included so that you can see what each routine does.

Call	Description
SYS 49152	Jagged right
SYS 49155	Split right
SYS 49158	Diagonal right
SYS 49161	Split right up colour
SYS 49164	Split right up
SYS 49167	Jagged left
SYS 49170	Split
SYS 49173	Double split
SYS 49176	Secondary double split
SYS 49182	Double break
SYS 49185	Strip
SYS 49188	Left beak
SYS 49191	Right break
SYS 49194	Bottom break split
SYS 49197	Routine 1
SYS 49200	Routine 2
SYS 49203	Quarter Split
SYS 49206	Shake quarter split
SYS 49209	Pull apart split
SYS 49212	Strip shake
SYS 49215	Shoot off
SYS 49218	Shoot shake play

PROGRAM: ALL CLEAR GEN

```
1000 REM ***************************
***
1010 REM *
  *
1020 REM *     ALL CLEAR GENERATOR
  *
1030 REM *
  *
1040 REM ***************************
***
2000 FORL=0TO128:CX=0:FORD=0TO15:REA
DA:CX=CX+A:POKE49152+L*16+D,A:NEXTD
2010 READA:IFA<>CXTHENPRINT"ERROR IN
 LINE";2040+(L*10):STOP
2020 NEXTL
2040 DATA76,69,192,76,83,192,76,104,
192,76,123,192,76,149,192,76,1944
2050 DATA170,192,76,184,192,76,198,1
92,76,214,192,76,230,192,76,246,2582
2060 DATA192,76,6,193,76,19,193,76,3
5,193,76,51,193,76,70,193,1718
2070 DATA76,86,193,76,114,193,76,146
,193,76,184,193,76,219,193,76,2170
2080 DATA0,194,76,63,194,160,0,32,12
6,194,32,163,194,200,192,40,1860
2090 DATA48,245,96,160,0,32,126,194,
200,192,40,48,248,160,0,32,1821
2100 DATA163,194,200,192,40,48,248,9
6,160,0,32,126,194,32,163,194,2082
2110 DATA169,13,32,210,255,200,192,2
5,48,240,96,160,0,32,126,194,1992
2120 DATA200,192,40,48,248,160,0,32,
97,197,169,13,32,210,255,200,2093
2130 DATA192,25,48,243,96,160,0,32,1
26,194,200,192,40,48,248,169,2013
2140 DATA13,32,210,255,200,192,64,48
,246,96,160,0,32,97,197,32,1874
2150 DATA60,197,200,192,40,48,245,96
,160,0,32,97,197,32,126,194,1916
2160 DATA200,192,40,48,245,96,160,0,
32,60,197,32,163,194,200,192,2051
2170 DATA30,48,245,76,184,192,160,0,
32,97,197,32,126,194,200,192,2005
2180 DATA10,48,245,76,198,192,160,0,
32,115,197,32,144,194,200,192,2035
2190 DATA20,48,245,76,214,192,160,0,
32,124,197,32,153,194,200,192,2079
2200 DATA40,48,245,76,230,192,160,0,
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32,60,197,200,192,40,48,248,2008
2210 DATA76,246,192,160,0,32,60,197,
32,97,197,200,192,10,48,245,1984
2220 DATA76,214,192,160,0,32,126,194
,32,163,194,200,192,15,48,245,2083
2230 DATA76,19,193,160,0,32,97,197,3
2,124,197,32,126,194,200,192,1871
2240 DATA10,48,242,76,35,193,160,0,3
2,163,194,32,60,197,200,192,1834
2250 DATA15,48,245,76,51,193,160,0,3
2,172,194,32,69,197,32,181,1697
2260 DATA194,32,78,197,32,190,194,32
,87,197,200,192,5,48,233,76,1987
2270 DATA70,193,160,0,32,163,194,32,
126,194,32,172,194,32,135,194,1923
2280 DATA32,181,194,32,144,194,32,19
0,194,32,153,194,200,192,40,48,2052
2290 DATA227,96,160,0,32,163,194,32,
126,194,32,172,194,32,135,194,1983
2300 DATA32,115,197,32,78,197,32,124
,197,32,87,197,32,124,197,32,1705
2310 DATA87,197,200,192,40,48,221,96
,160,0,32,163,194,32,60,197,1919
2320 DATA32,172,194,32,69,197,32,78,
197,32,190,194,32,87,197,32,1767
2330 DATA190,194,32,87,197,200,192,4
0,48,224,96,160,0,32,97,197,1986
2340 DATA32,126,194,32,106,197,32,10
6,197,32,124,197,32,69,197,32,1705
2350 DATA144,194,32,78,197,32,153,19
4,200,192,20,48,224,76,86,193,2063
2360 DATA160,0,32,22,195,32,100,199,
32,81,198,200,192,40,48,242,1773
2370 DATA160,0,32,56,198,32,106,198,
32,228,194,32,41,196,32,50,1587
2380 DATA199,200,192,40,48,236,160,0
,32,156,198,32,0,199,32,10,1734
2390 DATA197,32,47,195,32,191,196,20
0,192,40,48,236,76,6,193,160,2041
2400 DATA0,32,137,197,32,162,197,32,
200,199,32,175,199,32,222,195,2043
2410 DATA32,181,198,200,192,40,48,23
3,160,0,32,253,194,32,237,197,2229
2420 DATA32,231,198,32,22,195,32,216
,196,32,191,196,200,192,40,48,2053
2430 DATA233,160,0,32,60,197,200,192
,15,48,248,76,219,193,32,228,2133
2440 DATA194,32,22,195,32,72,195,32,
122,195,32,172,195,32,222,195,1939
2450 DATA32,16,196,32,66,196,32,116,
196,32,166,196,32,216,196,32,1752
2460 DATA10,197,96,32,203,194,32,253
,194,32,47,195,32,97,195,32,1841
2470 DATA147,195,32,197,195,32,247,1
95,32,41,196,32,91,196,32,141,2001
2480 DATA196,32,191,196,32,241,196,3
2,35,197,96,162,32,142,255,3,2038
2490 DATA162,39,189,255,3,157,0,4,18
9,255,215,157,0,216,202,224,2267
2500 DATA0,16,239,96,162,32,142,39,4
,162,39,189,39,4,157,40,1360
2510 DATA4,189,39,216,157,40,216,202
,224,0,16,239,96,162,32,142,1974
2520 DATA79,4,162,39,189,79,4,157,80
,4,189,79,216,157,80,216,1734
2530 DATA202,224,0,16,239,96,162,32,
142,119,4,162,39,189,119,4,1749
2540 DATA157,120,4,189,119,216,157,1
20,216,202,224,0,16,239,96,162,2237
2550 DATA32,142,159,4,162,39,189,159
,4,157,160,4,189,159,216,157,1932
2560 DATA160,216,202,224,0,16,239,96
,162,32,142,199,4,162,39,189,2082
2570 DATA199,4,157,200,4,189,199,216
,157,200,216,202,224,0,16,239,2422
2580 DATA96,162,32,142,239,4,162,39,
189,239,4,157,240,4,189,239,2137
2590 DATA216,157,240,216,202,224,0,1
6,239,96,162,32,142,23,5,162,2132
2600 DATA39,189,23,5,157,24,5,189,23
,217,157,24,217,202,224,0,1695
2610 DATA16,239,96,162,32,142,63,5,1
62,39,189,63,5,157,64,5,1439
2620 DATA189,63,217,157,64,217,202,2
24,0,16,239,96,162,32,142,103,2123
2630 DATA5,162,39,189,103,5,157,104,
5,189,103,217,157,104,217,202,1958
2640 DATA224,0,16,239,96,162,32,142,
143,5,162,39,189,143,5,157,1754
2650 DATA144,5,189,143,217,157,144,2
17,202,224,0,16,239,96,162,32,2187
2660 DATA142,183,5,162,39,189,183,5,
157,184,5,189,183,217,157,184,2184
2670 DATA217,202,224,0,16,239,96,162
,32,142,223,5,162,39,189,223,2171
2680 DATA5,157,224,5,189,223,217,157
,224,217,202,224,0,16,239,96,2395
2690 DATA162,32,142,7,6,162,39,189,7
,6,157,8,6,189,7,218,1337
2700 DATA157,8,218,202,224,0,16,239,
96,162,32,142,47,6,162,39,1750
2710 DATA189,47,6,157,48,6,189,47,21
8,157,48,218,202,224,0,16,1772
2720 DATA239,96,162,32,142,87,6,162,
39,189,87,6,157,88,6,189,1687
2730 DATA87,218,157,88,218,202,224,0
,16,239,96,162,32,142,127,6,2014
2740 DATA162,39,189,127,6,157,128,6,
189,127,218,157,128,218,202,224,2277
2750 DATA0,16,239,96,162,32,142,167,
6,162,39,189,167,6,157,168,1748
2760 DATA6,189,167,218,157,168,218,2
02,224,0,16,239,96,162,32,142,2236
2770 DATA207,6,162,39,189,207,6,157,
208,6,189,207,218,157,208,218,2384
2780 DATA202,224,0,16,239,96,162,32,
142,247,6,162,39,189,247,6,2009
2790 DATA157,248,6,189,247,218,157,2
48,218,202,224,0,16,239,96,162,2627
2800 DATA32,142,31,7,162,39,189,31,7
,157,32,7,189,31,219,157,1432
2810 DATA32,219,202,224,0,16,239,96,
162,32,142,71,7,162,39,189,1832
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2820 DATA71,7,157,72,7,189,71,219,15
7,72,219,202,224,0,16,239,1922
2830 DATA96,162,32,142,111,7,162,39,
189,111,7,157,112,7,189,111,1634
2840 DATA219,157,112,219,202,224,0,1
6,239,96,162,32,142,151,7,162,2140
2850 DATA39,189,151,7,157,152,7,189,
151,219,157,152,219,202,224,0,2215
2860 DATA16,239,96,162,32,142,191,7,
162,39,189,191,7,157,192,7,1829
2870 DATA189,191,219,157,192,219,202
,224,0,16,239,96,32,162,197,32,2367
2880 DATA212,197,32,6,198,32,56,198,
32,106,198,32,156,198,32,206,1891
2890 DATA198,32,0,199,32,50,199,32,1
00,199,32,150,199,32,200,199,1853
2900 DATA96,32,137,197,32,187,197,32
,237,197,32,31,198,32,81,198,1916
2910 DATA32,131,198,32,181,198,32,23
1,198,32,25,199,32,75,199,32,1827
2920 DATA125,199,32,175,199,32,225,1
99,96,162,32,142,40,4,162,0,1824
2930 DATA189,0,4,157,255,3,189,0,216
,157,255,215,232,224,40,48,2184
2940 DATA239,96,162,32,142,80,4,162,
0,189,40,4,157,39,4,189,1539
2950 DATA40,216,157,39,216,232,224,4
0,48,239,96,162,32,142,120,4,2007
2960 DATA162,0,189,80,4,157,79,4,189
,80,216,157,79,216,232,224,2068
2970 DATA40,48,239,96,162,32,142,160
,4,162,0,189,120,4,157,119,1674
2980 DATA4,189,120,216,157,119,216,2
32,224,40,48,239,96,162,32,142,2236
2990 DATA200,4,162,0,189,160,4,157,1
59,4,189,160,216,157,159,216,2136
3000 DATA232,224,40,48,239,96,162,32
,142,240,4,162,0,189,200,4,2014
3010 DATA157,199,4,189,200,216,157,1
99,216,232,224,40,48,239,96,162,2578
3020 DATA32,142,24,5,162,0,189,240,4
,157,239,4,189,240,216,157,2000
3030 DATA239,216,232,224,40,48,239,9
6,162,32,142,64,5,162,0,189,2090
3040 DATA24,5,157,23,5,189,24,217,15
7,23,217,232,224,40,48,239,1824
3050 DATA96,162,32,142,104,5,162,0,1
89,64,5,157,63,5,189,64,1439
3060 DATA217,157,63,217,232,224,40,4
8,239,96,162,32,142,144,5,162,2180
3070 DATA0,189,104,5,157,103,5,189,1
04,217,157,103,217,232,224,40,2046
3080 DATA48,239,96,162,32,142,184,5,
162,0,189,144,5,157,143,5,1713
3090 DATA189,144,217,157,143,217,232
,224,40,48,239,96,162,32,142,224,250
6
3100 DATA5,162,0,189,184,5,157,183,5
,189,184,217,157,183,217,232,2269
3110 DATA224,40,48,239,96,162,32,142
,8,6,162,0,189,224,5,157,1734
3120 DATA223,5,189,224,217,157,223,2
17,232,224,40,48,239,96,162,32,2528
3130 DATA142,48,6,162,0,189,8,6,157,
7,6,189,8,218,157,7,1310
3140 DATA218,232,224,40,48,239,96,16
2,32,142,88,6,162,0,189,48,1926
3150 DATA6,157,47,6,189,48,218,157,4
7,218,232,224,40,48,239,96,1972
3160 DATA162,32,142,128,6,162,0,189,
88,6,157,87,6,189,88,218,1660
3170 DATA157,87,218,232,224,40,48,23
9,96,162,32,142,168,6,162,0,2013
3180 DATA189,128,6,157,127,6,189,128
,218,157,127,218,232,224,40,48,2194
3190 DATA239,96,162,32,142,208,6,162
,0,189,168,6,157,167,6,189,1929
3200 DATA168,218,157,167,218,232,224
,40,48,239,96,162,32,142,248,6,2397
3210 DATA162,0,189,208,6,157,207,6,1
89,208,218,157,207,218,232,224,2588
3220 DATA40,48,239,96,162,32,142,32,
7,162,0,189,248,6,157,247,1807
3230 DATA6,189,248,218,157,247,218,2
32,224,40,48,239,96,162,32,142,2498
3240 DATA72,7,162,0,189,32,7,157,31,
7,189,32,219,157,31,219,1511
3250 DATA232,224,40,48,239,96,162,32
,142,112,7,162,0,189,72,7,1764
3260 DATA157,71,7,189,72,219,157,71,
219,232,224,40,48,239,96,162,2203
3270 DATA32,142,152,7,162,0,189,112,
7,157,111,7,189,112,219,157,1755
3280 DATA111,219,232,224,40,48,239,9
6,162,32,142,192,7,162,0,189,2095
3290 DATA152,7,157,151,7,189,152,219
,157,151,219,232,224,40,48,239,2344
3300 DATA96,162,32,142,232,7,162,0,1
89,192,7,157,191,7,189,192,1957
3310 DATA219,157,191,219,232,224,40,
48,239,96,224,0,0,0,0,0,1889
3320 DATA0,67,0,3,0,31,0,91,0,27,0,9
1,0,27,4,91,432
4000 REM ***************************
***
4010 REM *          SAVE ROUTINE
  *
4020 REM *
  *
4030 REM *IF USING CASSETTE MAKE SUR
E *
4040 REM *THAT YOU CHANGE THE :
  * 4050 REM * ,8,1 AFTER SAVE "ALL
CLEAR"*
4060 REM * TO ,1,1
4070 REM *
  *
4080 REM ***************************
***
4090 POKE43,0:POKE44,192:POKE45,2:PO
KE46,200
4100 SAVE "ALL CLEAR",8,1

READY.
```

Adventure Aid GRAPHICS

Allen Webb shows how to add graphics to your adventure programs.

MANY PEOPLE WHO BEcome addicted to programming their home computers, enjoy the challenge of writing their own adventure games. This is all very well, but one area where you may have trouble is in providing the graphics which will enhance your finished work. This program will do just that.

It is designed to complement the Adventure aid program which appeared in *Your Commodore*, May '86.

The problem with using graphics in adventures is that there is an inevitable conflict for memory. Since graphics are memory hungry, their use needs a degree of cunning. There are a number of ways of implementing them.

1. Use of high resolution bit mapping. This is particularly demanding on memory with a full screen requiring 8K of RAM.

There are a number of ways of using this system.

Firstly, pictures can be loaded direct from storage. This, however, is only suitable for disk based systems.

Alternatively, you can draw the picture using simple drawing and filling commands. This tends to give pictures of limited complexity but works quite well. Another way is to store high resolution pictures in RAM using data compression.

2. Use redefined characters. There is a minimum overhead of 1024 bytes per character set, but with interrupts or fast data moving you can use several character sets. You must, however, develop a system of encoding pictures in a memory efficient way. This method is not used that frequently with commercial adventures (Taskset's *Souls of Darkon* is an exception). Arcade adventures however, rarely use anything else.

3. Use sprites. This method has a number of bonuses and is the method I've chosen.

C64 Painter

This package uses a block of sprites – four wide by two high – to provide a rectangular picture. This has a memory overhead of 512 bytes plus 512 bytes per picture. The system also saves the colours giving a further 10 bytes overhead per picture. The virtues of the system are:

1. You can position the picture anywhere on screen.
2. You can use sprite expansion to give pictures of four sizes.
3. The range of colours is wide: Each basic sprite has three colours plus the background colour; the background colour can be extended by placing characters behind the sprite – these can be reverse spaces or other shadings to give textures.

Overall, the theoretical maximum number of colours in any given sprite square is 16 (assuming fully expandable sprites).

4. You don't need interrupts to mix text and pictures.
5. The resolution is the same as bit mapped mode.

As I explained, the picture comprises of a block of eight sprites offering a resolution of 96 points horizontally and 42 points vertically. The code allows you to create and manipulate pictures.

I plan to show you how to generate pictures using two methods:

1. By recalling pre-drawn pictures as blocks of data from RAM.
2. Using a sequence of commands to draw the picture as you need it.

Since the code is rather large, the article will be in two parts. This part introduces the code and tells you how to use it. Next time I will give two editors and describe their use.

How it Works

First, let me describe the code. The machine code is loaded in the usual way (Listing 1) and starts at $7800. The loader automatically drops the top of Basic to protect the code. The commands offered are listed in Table 1.

These commands need a little more explanation.

Command 1 initialises the picture and puts it on the screen. All sprites are set to colour – COL – and TYPE specifies the type of picture i.e. 0=Highres and 1=multicolour. XEX and YEX specify whether or not the picture is expanded – 1=expanded, 0=contracted. X and Y are the co-ordinates of the top left corner of the picture.

Command 2 sets up the individual sprite colours.

Command 3 specifies the multicolour registers and the background colour.

Command 4 fills the picture with a specified byte. A value of zero clears the screen.

Command 5 changes a dot at position X and Y in a high resolution picture. FLAG decides how the dot is changed:

0 – erases the point
1 – sets the point
2 – flips the point

Y is in the range zero to 41 and X in the range zero to 95.

Command 6 turns off the picture.

Command 7 draws a multicolour dot at X,Y. Y is in the range zero to 41 and X in the range zero to 47 (don't forget that a multicolour dot is twice the width of a high resolution dot). The pen specifies the colour:

0 – background colour
1 – colour register 1 (C1)
2 – the sprite colour as specified in commands 1 or 2
3 – colour register 2 (C3)

Command 8 flips the picture.

Command 9 draws a high resolution line according to FLAG between X1,Y1 and X2,Y2. The resolution and FLAG values are as for command 5 except that values of four and five give dotted lines. A value of four starts the line with a dot and the value five starts it with a space. In multicolour mode, this command draws a multicolour line with the same X range as high resolution and the pen value is as for command 7. This allows the use of the same coding in either mode.

Command 10 is included to give compatability with command 7. It is identical to command 9 in multicolour mode but uses an X value in the range zero to 47. This is clearly more correct than zero to 95.

Command 11 moves the picture to an area of RAM. This is stored as 512 bytes followed by 10 bytes holding the colour data. You can use any RAM except for the lower portion below 2049. The area behind the ROMs is particularly handy.

Command 12 recalls a

picture from a specified address in RAM. All colour registers are updated appropriately.

Command 13 mixes a picture in RAM with the current picture according to a specified rule:
0 – AND
1 – OR
2 – .EOR
The colour registers are not involved in this command.

Command 14 saves a block of RAM between addresses SA and EA to disk or cassette (depending on DEV). Only the area up to $CFFF can be saved.

Command 15 tells the machine which sprites to use.

Commands 16 and 17 draw a random pattern of dots as from an airbrush. Command 16 uses high resolution mode and command 17 uses multicolour. The pattern occupies a rectangle with its top left corner at position X and Y. DENSITY has a value from one to 255 and decides how many dots are drawn in this rectangle. SIZE specifies the size of the rectangle and has the values zero for small, one for medium and two for large. FLAG and PEN act as described before for the Dot commands.

Commands 18 and 19 draw filled rectangles. The top left corner is specified by X1,Y1 and the bottom right corner by X2,Y2. FLAG and PEN are as for the line commands. FLAG set to four, for example, will draw a stripey square. FLAG set to two will flip a rectangular area.

Commands 20 and 21 draw triangular shapes. X1 and Y1 specify the position of the apex. X2 and Y2 specify the bottom left corner. The main constraint is that the base must be horizontal and the bottom right corner is therefore specified by X3 and Y2.

Command 21 draws a sequence of shapes.

You will have noticed that the scaling is different for high resolution and multicolour modes. In high resolution modes, the routines ensure that X values remain in the range zero to 95. In multicolour mode, X values are kept in the range zero to 47. In both modes, Y remains in the range zero to 41. The error trapping means that if you try to exceed these ranges, you will simply get a dot at the maximum value. If, for example, you try to plot a dot at X=100 and Y=100 in high resolution mode, you will get a dot at X=95 and Y=10.

In order to give you maximum flexibility, I have written the code to act on any sprite positions. All you need to do is tell it the position of the sprite pointers and the starting position of the picture (using command 15). As I will show in the next part, the most effective way of using this system is to raise the start of Basic and use the block starting at sprite 32 in the default block with the screen at the normal location. The sprite pointers therefore start at 2040 and command 15 has the form:

SYS SA+42,2040,32

You must use this command before you use any other commands otherwise you will probably corrupt the machine and cause a crash.

The picture comprises of a block of sprites starting at a specified position. In the above situation, the picture occupies sprites 32 through to 39 inclusive. Consider this to be your display area. You can use RAM as a scratch pad to save and recall designs to the display area using commands 11 and 12. If you were using this system in an adventure, you would have the pictures stored in RAM as a series of 522 byte blocks. You could then use command 12 to display them at will.

Table 1

Command	Name	Syntax
1	INIT	SYS SA,X,Y,COL,TYPE,XEX, YEX
2	COL CHANGE	SYS SA+3,C1,C2,C3,C4,C5, C6,C7,C8
3	COLREGS	SYS SA+6,C1,C3, Background
4	FILL	SYS SA+9,BYTE
5	DOT	SYS SA+12,X,Y,FLAG
6	OFF	SYS SA+15
7	MULTIDOT	SYS SA+18,X,Y,PEN
8	INVERT	SYS SA+21
9	LINE	SYS SA+24,X1,Y1,X2,Y2, FLAG
10	MULTILINE	SYS SA27,X1,Y1,X2,Y2,PEN
11	SAVE	SYS SA+20,ADDRESS
12	LOAD	SYS SA+33,ADDRESS
13	MIX	SYS SA+36,ADDRESS,RULE
14	SAVE	SYS SA+39 "FILENAME", DEV,2,SA,EA
15	SETUP	SYS SA+42,POINTER, SPRNO
16	BRUSH	SYS SA+45,X,Y,DENSITY, SIZE,FLAG
17	MULTI BRUSH	SYS SA+48,X,Y,DENSITY, SIZE,PEN
18	SUARE	SYS SA+51,X1,Y1,X2,Y2, FLAG
19	MULTI SQUARE	SYS SA+54,X1,Y1,X2,Y2, PEN
20	TRIANGLE	SYS SA+57,X1,Y1,X2,Y2,X3, FLAG
21	MULTI TRIANGLE	SYS SA+60,X1,Y1,X2,Y2,X3, PEN
22	SEQUENCE	SYS SA+63,ADDRESS

SA is equal to 30720

PROGRAM: DEMO.1

```
1 REM******************
2 REM* SPRITE PICTURES *
3 REM* DEMONSTRATION 1 *
4 REM******************
10 SA=30720
20 SYS SA+42,2040,248
   : REM SET UP SPRITE POSITION
30 XS=91: YS=52
40 SYS SA.XS.YS,1,0,1,1
   : REM PUT ON SCREEN
50 SYS SA+9.0: REM CLEAR IT
60 FOR X=0 TO 95 STEP 6
70 SYS SA+24.0,Y,X,41,1: Y=Y+3
   : NEXT
80 FOR I=1 TO 20: SYS SA.XS.YS.1,0,
   RND(1)*2.RND(1)*2
90 FOR D=1 TO 200:NEXT:NEXT
95 SYS SA,XS,YS,1,1,1,1
96 FOR I=0 TO 7:C(I)=RND(1)*16:NEXT
97 SYS SA+3,C(0),C(1),C(2),C(3),
   C(4),C(5),C(6),C(7)
101 SYS SA+30,40960
102 SYS SA+9,0
103 FOR I=1 TO 20
104 SYS SA+24,RND(1)*96,RND(1)*42,
   RND(1)*95,RND(1)*42,RND(1)*4
   :NEXT
107 SYS SA+36,40960,2: SYS SA+21
110 FOR J=1 TO 100:SYS SA+6,
   RND(1)*16,RND(1)*16,6
120 FOR I=0 TO 7:C(I)=RND(1)*16
   :NEXT
125 SYS SA,RND(1)*60+40,
   RND(1)*100+50,1,1,RND(1)*2,
   RND(1)*2
130 SYS SA+3,C(0),C(1),C(2),C(3),
   C(4),C(5),C(6),C(7):NEXT
```

Demonstrations

DEMO 1 shows briefly what the commands can do.

The sequence command is a way of saving drawing instructions as a sequence of numbers. The instruction runs through the data starting at the specified address and executes the instructions until the number 255 is met. All commands have the same form. The first number in a sequence identifies the instruction and this is followed by the required parameters. The supported commands are:

Code	Function
0	command 1
1	command 2
2	command 3
3	command 4
4	command 5
5	command 7
6	command 9
7	command 10
8	command 18
9	command 19
10	command 20
11	command 21
12	command 16
13	command 17

These codes are followed by the requisite parameters as specified in the commands given earlier. Here are some examples:

To draw a line in high resolution mode from 0,0 to 30,30, the byte sequence is:

6,0,0,30,30,1

To set up a full size, multicolour picture at 90,50 with all sprites set to red, the byte sequence is:

0,90,50,2,1,1,1

DEMO 2 shows how this works. The data statements hold each command sequence and these are POKEd sequentially into the area starting at 53000. A single SYS call is then all that is needed to draw the picture.

If you use the sequence command you must be careful since there is no protection offered by the error detection. Additionally, apart from the multibrush routine, all multicolour scaling is removed. In fact, scaling gets a little messy and inconsistent. All high resolution mode commands act as before. Multicolour commands use the same zero to 95 range for X but must start using an even value for X. If you think about it, it's obvious since each bit pair starts on an even number.

The square and triangle commands require that you set the X2 and X3 co-ordinates respectively are set to one higher than you need. Again this is because the sequence command bypasses the user-friendly inputs to the commands. Finally, you must ensure that the airbrush area does not overlap the top bounds of the window. If the top left corner of the brush area is at X,Y then you must ensure that (X+WI)<96 and (Y+HI)<42 where WI and HI are as in Table 2.

	High Resolution		Multicolour	
SIZE	WI	HI	WI	HI
0	4	4	8	4
1 8	8	16	8	
2	16	16	32	16

In order to make the sequence command operate as quickly as possible, it expects a sequence less than 254 bytes in length. This is no hardship since you can use any number of sequences to draw a picture.

Don't worry if all these restrictions appear to complicate life, next time I'll provide an editor which will take care of everything for you.

PROGRAM: DEMO.2

```
1 REM*******************
2 REM* SPRITE PICTURES *
3 REM* DEMONSTRATION 2 *
4 REM*******************
10 DATA  0.91.58.15,1.1.0
20 DATA  1.14.14.14.14.8.8.8.8
30 DATA  2.11.12.0
40 DATA  3.0
50 DATA  8.0.0.95.21.2
60 DATA  8.0.21.95.42.2
70 DATA  11,10.13.0.20.16.3
80 DATA  11,10.13.0.20.4.1
90 DATA  11,20.12.12.20.26.3
100 DATA  11.20.12.12.20.12.1
110 DATA  11.30.14.24.20.44.3
120 DATA  11.30.14.24.20.30.1
130 DATA  11.48.11.38.20.56.3
140 DATA  11,48.11.38.20.44.1
150 DATA  11.66.12.54.20.86.3
160 DATA  11.66.12.54.20.64.1
170 DATA  13.0.21.10.1.0
180 DATA  13.8.21.10.1.0
190 DATA  13.16.21.10.1.0
200 DATA  13.24.21.10.1.0
210 DATA  13.32.21.10.1.0
220 DATA  13.40.21.10.1.0
221 DATA  7.66,5,70,5,0
222 DATA  7.64.6.74.6.0
223 DATA  7.63.7.79.7.0
224 DATA  7.61.8.83.8.0
225 DATA  7.63,9,81,9,0
230 DATA 255
240 FOR I=0 TO 170:READ X
   : POKE 53000+I.X:NEXT
250 SA=30720
260 SYS SA+42.2040.248
265 PRINT CHR$(147)
266 PRINT"[HOME,RVSON,C8,DOWN]
   "TAB(23)"[SPC6,DOWN,LEFT6,C3,
   SPC7]"
267 PRINT"[C2]"TAB(8)"[RVSON.CK.
   SPC23]"
268 PRINT"[YELLOW]"TAB(8)"[RVSON.
   CK,SPC23]"
270 SYS SA+63,53000
```

PROGRAM: LOADER

```
10 REM*******************
20 REM* SPRITE GRAPHICS *
30 REM*[SPC3]A + M[SPC2]1986[SPC3]*
40 REM*******************
2000 FOR L=0 TO 180:CX=0
   :FOR D=0 TO 15:READ A:CX=CX+A
   :POKE 30720+L*16+D,A:NEXT D
2010 READ A:IF A<>CX THEN PRINT"ER
   ROR IN LINE";2040+(L*10):STOP
2020 NEXT L:POKE 56.120: NEW
2040 DATA 76,66,120,76,42,121,76,
   69,121,76,94.121.76,144,121.76,
   1475
2050 DATA 201.122,76,207,122,76,62,
```

```
123,76,105,123,76,194,124,76,
250,2013
2060 DATA 124,76,85,125,76,189,125,
76,70,126,76,113,126,76,158,126,
1747
2070 DATA 76,17,127,76,96,127,76,
196,127,76,37,128,76,179,128,76,
1618
2080 DATA 34,129,32,148,120,165,20,
141,62,3,32,148,120,165,20,141,
1480
2090 DATA 63,3,32,148,120,165,20,
141,64,3,32,148,120,165,20,141,
1385
2100 DATA 65,3,32,148,120,165,20,
141,66,3,32,148,120,165,20,141,
1389
2110 DATA 67,3,32,158,120,32,211,
120,32,11,121,32,25,121,169,255,
1509
2120 DATA 174,105,3,160,0,138,145,
168,232,200,192,8,208,247,160,
255,2395
2130 DATA 140,21,208,96,32,253,174,
32,138,173,32,247,183,96,173,66,
2064
2140 DATA 3,208,13,169,24,141,68,3,
169,0,141,29,208,76,186,120,1558
2150 DATA 169,48,141,68,3,169,255,
141,29,208,173,62,3,160,0,153,
1782
2160 DATA 0,208,153,8,208,200,200,
192,8,240,7,24,109,68,3,76,1704
2170 DATA 191,120,96,173,67,3,208,
13,169,21,141,68,3,169,0,141,
1583
2180 DATA 23,208,76,239,120,169,42,
141,68,3,169,255,141,23,208,173,
2058
2190 DATA 63,3,160,1,153,0,208,200,
200,192,9,208,247,24,109,68,1845
2200 DATA 3,153,0,208,200,200,192,
17,208,247,96,160,0,173,64,3,
1924
2210 DATA 153,39,208,200,192,8,208,
248,96,173,65,3,208,6,169,0,1976
2220 DATA 141,28,208,96,169,255,
141,28,208,96,169,0,141,69,3,32,
1784
2230 DATA 148,120,165,20,172,69,3,
153,39,208,238,69,3,173,69,3,
1652
2240 DATA 201,8,208,235,96,32,148,
120,165,20,141,37,208,32,148,
120,1919
2250 DATA 165,20,141,38,208,32,148,
120,165,20,141,33,208,96,32,148,
1715
2260 DATA 120,165,20,141,68,3,165,
170,133,251,165,171,133,252,160,
0,2117
2270 DATA 173,68,3,145,251,165,251,
24,105,1,133,251,165,252,105,0,
2092
2280 DATA 133,252,165,251,197,170,
208,232,165,252,205,106,3,208,
225,96,2868
2290 DATA 32,148,120,165,20,32,49,
126,141,70,3,32,148,120,165,20,
1391
2300 DATA 32,63,126,141,71,3,32,
148,120,165,20,141,80,3,169,24,
1338
2310 DATA 141,68,3,173,70,3,32,181,
122,136,140,72,3,169,21,141,1475
2320 DATA 68,3,173,71,3,32,181,122,
136,140,73,3,160,4,173,73,1415
2330 DATA 3,141,68,3,32,191,122,24,
109,72,3,141,74,3,160,24,1170
2340 DATA 173,72,3,141,68,3,32,191,
122,141,75,3,173,70,3,56,1326
2350 DATA 237,75,3,141,75,3,74,74,
74,141,76,3,10,10,10,141,1147
2360 DATA 77,3,173,75,3,56,237,77,
3,141,77,3,160,21,173,73,1352
2370 DATA 3,141,68,3,32,191,122,
141,78,3,173,71,3,56,237,78,1400
2380 DATA 3,141,78,3,160,3,141,68,
3,32,191,122,24,109,76,3,1157
2390 DATA 141,79,3,169,0,133,252,
173,74,3,133,251,160,0,6,251,
1828
2400 DATA 38,252,200,192,6,208,247,
24,165,251,109,79,3,133,251,165,
2323
2410 DATA 252,105,0,133,252,24,165,
251,101,170,133,251,165,252,101,
171,2526
2420 DATA 133,252,173,107,3,240,3,
32,172,122,173,80,3,240,22,201,
1956
2430 DATA 1,240,5,201,2,240,30,96,
172,77,3,185,164,122,160,0,1698
2440 DATA 17,251,145,251,96,172,77,
3,169,255,56,249,164,122,160,0,
2187
2450 DATA 49,251,145,251,96,172,77,
3,185,164,122,160,0,49,251,240,
2215
2460 DATA 215,76,133,122,128,64,32,
16,8,4,2,1,173,80,3,73,1130
2470 DATA 255,141,80,3,96,160,0,
200,56,237,68,3,16,249,96,169,
1829
2480 DATA 0,24,109,68,3,136,208,
249,96,169,0,141,21,208,96,32,
1560
2490 DATA 148,120,165,20,32,56,126,
141,70,3,14,70,3,32,148,120,1268
2500 DATA 165,20,32,63,126,141,71,
3,32,148,120,165,20,240,13,201,
1560
2510 DATA 1,240,24,201,2,240,38,
```

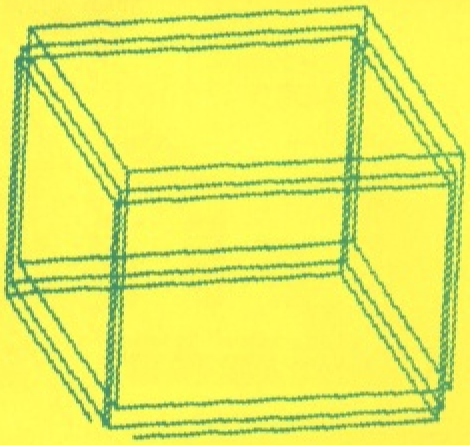
```
    201,3,240,52,96,169,0,141,80,
    1728
2520 DATA 3,32,174,121,238,70,3,32,
    174,121,96,169,0,141,80,3,1457
2530 DATA 32,174,121,238,70,3,238,
    80,3,32,174,121,96,169,1,141,
    1693
2540 DATA 80,3,32,174,121,238,70,3,
    206,80,3,32,174,121,96,169,1602
2550 DATA 1,141,80,3,32,174,121,
    238,70,3,32,174,121,96,165,170,
    1621
2560 DATA 133,251,165,171,133,252,
    160,0,177,251,73,255,145,251,
    165,251,2833
2570 DATA 24,105,1,133,251,165,252,
    105,0,133,252,165,251,197,170,
    208,2412
2580 DATA 231,165,252,205,106,3,
    208,224,96,32,148,120,165,20,32,
    49,2056
2590 DATA 126,141,82,3,32,148,120,
    165,20,32,63,126,141,84,3,32,
    1318
2600 DATA 148,120,165,20,32,49,126,
    141,83,3,32,148,120,165,20,32,
    1404
2610 DATA 63,126,141,85,3,32,148,
    120,165,20,141,80,3,169,0,141,
    1437
2620 DATA 107,3,32,148,128,173,83,
    3,56,237,82,3,141,86,3,173,1458
2630 DATA 85,3,56,237,84,3,141,87,
    3,169,1,141,88,3,141,89,1331
2640 DATA 3,173,87,3,16,10,160,255,
    140,88,3,73,255,24,105,1,1396
2650 DATA 141,90,3,173,86,3,16,10,
    160,255,140,89,3,73,255,24,1521
2660 DATA 105,1,141,91,3,173,91,3,
    56,237,90,3,141,92,3,16,1246
2670 DATA 35,169,255,141,93,3,169,
    0,141,94,3,173,90,3,141,95,1605
2680 DATA 3,173,91,3,141,96,3,173,
    87,3,48,5,169,1,141,93,1230
2690 DATA 3,76,52,124,169,0,141,93,
    3,169,255,141,94,3,173,91,1587
2700 DATA 3,141,95,3,173,90,3,141,
    96,3,173,86,3,48,5,169,1232
2710 DATA 1,141,94,3,173,95,3,141,
    97,3,56,237,96,3,141,98,1382
2720 DATA 3,173,96,3,141,99,3,78,
    95,3,173,96,3,56,237,95,1354
2730 DATA 3,141,100,3,173,82,3,141,
    70,3,173,84,3,141,71,3,1194
2740 DATA 173,28,208,240,14,173,70,
    3,41,254,141,70,3,32,235,122,
    1807
2750 DATA 76,118,124,32,174,121,
    173,100,3,16,30,24,109,99,3,141,
    1343
2760 DATA 100,3,173,82,3,24,109,94,
    3,141,82,3,173,84,3,24,1101
2770 DATA 109,93,3,141,84,3,76,180,
    124,56,237,98,3,141,100,3,1451
2780 DATA 173,82,3,24,109,89,3,141,
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    76,84,124,169,0,141,107,1289
2800 DATA 3,96,32,148,120,165,20,
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2810 DATA 32,148,120,165,20,32,63,
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    1419
2820 DATA 32,56,126,141,83,3,14,83,
    3,32,148,120,165,20,32,63,1121
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    251,145,253,24,165,251,105,1,
    133,2094
2860 DATA 251,165,252,105,0,133,
    252,24,165,253,105,1,133,253,
    165,254,2511
2870 DATA 105,0,133,254,165,251,
    197,170,208,220,165,252,205,106,
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2880 DATA 213,165,1,9,7,133,1,88,
    160,0,185,37,208,145,253,200,
    1805
2890 DATA 201,10,208,246,96,32,148,
    120,165,20,133,253,165,21,133,
    254,2205
2900 DATA 164,170,165,171,132,251,
    133,252,120,165,1,41,248,133,1,
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2910 DATA 0,177,253,145,251,24,165,
    251,105,1,133,251,165,252,105,0,
    2278
2920 DATA 133,252,24,165,253,105,1,
    133,253,165,254,105,0,133,254,
    165,2395
2930 DATA 251,197,170,208,220,165,
    252,205,106,3,208,213,160,0,177,
    253,2788
2940 DATA 153,132,3,200,192,10,208,
    246,165,1,9,7,133,1,88,160,1708
2950 DATA 0,185,132,3,153,37,208,
    200,192,10,208,245,96,32,148,
    120,1969
2960 DATA 165,20,133,253,165,21,
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    80,3,1853
2970 DATA 164,170,165,171,132,251,
    133,252,120,165,1,41,248,133,1,
    160,2307
2980 DATA 0,173,80,3,240,22,201,1,
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    2127
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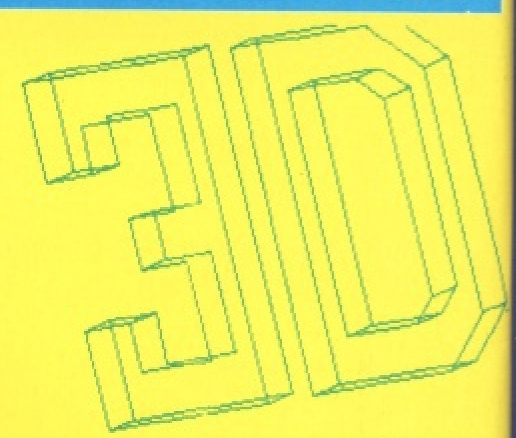
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24,2257
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165,254,105,0,133,254,165,251,
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3020 DATA 208,191,165,252,205,106,
3,208,184,165,1,9,7,133,1,88,
1926
3030 DATA 96,201,96,144,2,169,95,
96,201,48,144,2,169,47,96,201,
1807
3040 DATA 42,144,2,169,41,96,32,
212,225,32,148,120,165,20,72,
165,1685
3050 DATA 21,72,32,148,120,165,1,
41,254,133,1,166,20,164,21,104,
1463
3060 DATA 133,21,104,133,20,169,20,
32,95,225,165,1,9,1,133,1,1262
3070 DATA 96,32,148,120,165,20,164,
21,133,168,132,169,32,148,120,
164,1832
3080 DATA 20,140,105,3,132,170,169,
0,133,171,160,0,6,170,38,171,
1588
3090 DATA 200,192,6,208,247,24,165,
171,105,2,141,106,3,96,32,148,
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3100 DATA 120,165,20,141,103,3,32,
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3110 DATA 120,165,20,141,102,3,32,
148,120,165,20,141,101,3,32,148,
1461
3120 DATA 120,165,20,141,80,3,32,
236,126,24,109,103,3,32,49,126,
1369
3130 DATA 141,70,3,32,236,126,24,
109,104,3,32,63,126,141,71,3,
1284
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2018
3150 DATA 212,141,15,212,169,128,
141,18,212,169,128,141,24,212,
173,27,2122
3160 DATA 212,74,74,74,74,174,101,
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1461
3190 DATA 3,32,148,120,165,20,141,
80,3,32,236,126,24,109,103,3,
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3200 DATA 32,56,126,10,141,70,3,32,
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3210 DATA 126,141,71,3,32,235,122,
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1841
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109,1417
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1348
3250 DATA 148,120,165,20,141,101,3,
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3270 DATA 101,3,141,80,3,32,162,
123,238,110,3,173,110,3,205,111,
1598
3280 DATA 3,144,215,96,32,148,120,
165,20,32,56,126,141,108,3,14,
1423
3290 DATA 108,3,32,148,120,165,20,
32,63,126,141,110,3,32,148,120,
1371
3300 DATA 165,20,32,56,126,141,109,
3,14,109,3,32,148,120,165,20,
1263
3310 DATA 32,63,126,141,111,3,238,
111,3,32,148,120,165,20,141,80,
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3320 DATA 3,173,110,3,141,84,3,141,
85,3,173,108,3,141,82,3,1256
3330 DATA 173,109,3,141,83,3,32,
162,123,238,110,3,173,110,3,205;
1671
3340 DATA 111,3,144,221,96,32,148,
120,165,20,32,49,126,141,108,3,
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3350 DATA 32,148,120,165,20,32,63,
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148,120,165,20,32,63,126,141,
111,1418
3370 DATA 3,32,148,120,165,20,141,
102,3,238,102,3,32,148,120,165,
1542
3380 DATA 20,141,101,3,141,80,3,
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1287
3390 DATA 141,82,3,173,111,3,141,
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123,238,109,3,173,109,3,205,102,
1587
3410 DATA 3,144,212,96,173,80,3,
201,4,208,9,169,1,141,107,3,1554
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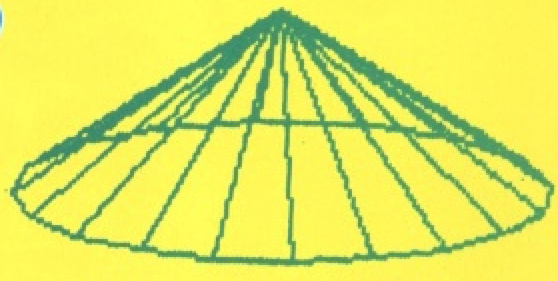
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    1245
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    63.126.141.110,3,32,148,120,165,
    1428
3450 DATA 20.32.49.126.141.109.3.
    14,109,3,32,148,120,165,20,32,
    1123
3460 DATA 63.126,141.111,3,32,148,
    120.165,20,141,102,3,238,102,3,
    1518
3470 DATA 14.102,3,32,148,120,165,
    20.141,80,3,173,110,3,141,84,
    1339
3480 DATA 3.173,108,3,141,82,3,173,
    111,3,141,85,3,173,109,3,1314
3490 DATA 141,83,3,32,162,123,238,
    109,3,173,109,3,205,102,3,144,
    1633
3500 DATA 218,96,32,148,120,165,20,
    133,180,165,21,133,181,169,0,
    141,1922
3510 DATA 114,3,172,114,3,177,180,
    201,255,240,20,170,189,43,131,
    141,2153
3520 DATA 112,3,189,57,131,141,113,
    3,200,140,114,3,108,112,3,96,
    1525
3530 DATA 177,180,141,62,3,200,177,
    180,141,63,3,200,177,180,141,64,
    2089
3540 DATA 3,200,177,180,141,65,3,
    200,177,180,141,66,3,200,177,
    180,2093
3550 DATA 141,67,3,200,140,114,3,
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    1528
3560 DATA 180,157,39,208,232,224,8,
    240,4,200,76,127,129,200,140,
    114,2278
3570 DATA 3,76,50,129,177,180,141,
    37,208,200,177,180,141,38,208,
    200,2145
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    140,114,3,76,50,129,177,180,141,
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3590 DATA 3,200,140,114,3,32,102,
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3600 DATA 200,177,180,141,71,3,200,
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    2010
3610 DATA 32,174,121,76,50,129,177,
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    1922
3620 DATA 3,200,177,180,133,20,200,
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3630 DATA 177,180,141,82,3,200,177,
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    141,1851
3660 DATA 84,3,200,177,180,141,83,
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    2034
3670 DATA 180,133,20,200,140,114,3,
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    141,1863
3680 DATA 108,3,200,177,180,141
    110,3,200,177,180,141,109,3,200,
    177,2109
3690 DATA 180,141,111,3,200,177,
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3710 DATA 180,141,109,3,200,177,
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    140,114,2256
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    50,129,177,180,141,108,3,200,
    177,1704
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    180,141,109,3,200,177,180,141,
    111,3,2056
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    200,177,180,200,140,114,3,133,
    20,32,2002
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    141,108,3,200,177,180,141,110,3,
    1900
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    200,177,180,141,111,3,200,177,
    180,141,2320
3770 DATA 102,3,200,177,180,200,
    140,114,3,133,20,32,97,128,76,
    50,1655
3780 DATA 129,177,180,141,103,3,
    200,177,180,141,104,3,200,177,
    180,141,2236
3790 DATA 102,3,200,177,180,141,
    101,3,200,177,180,200,140,114,3,
    32,1953
3800 DATA 195,126,76,50,129,177,
    180,141,103,3,200,177,180,141,
    104,3,1985
3810 DATA 200,177,180,141,102,3,
    200,177,180,141,101,3,200,177,
    180,200,2362
3820 DATA 140,114,3,133,20,32,54,
    127,76,50,129,80,125,148,172,
    187,1590
3830 DATA 214,240,23,61,99,137,181,
    225,5,129,129,129,129,129,129,
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    255,2441
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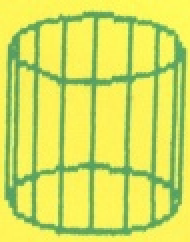

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The American Civil War is raging at its height. The Union and confederate armies are recruiting anyone old enough to hold a musket. It is a time for brave and fearless men. You are Johnny Reb—one of the bravest of them all.
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An accurate full scrolling graphics battle simulation
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LONDON W1R 7DB
01-439 0666
Spectrum,
Commodore,
Amstrad
£9.95
LOTHLORIEN

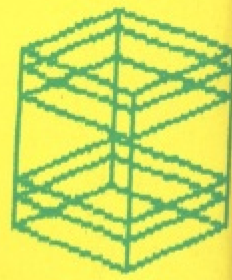
ART FOR ART'S SAKE











Evelyn Mills has been doodling with a new graphics package.

THE *3D GRAPHICS DRAWING BOARD* is, a recent addition to the growing collection of graphics software for the C64 and 128 and is a definite must for those interested in geometric design.

Using this program you can create 3D images on the screen using either cursor or joystick control; these images can be altered with the commands available in so many ways that there is ample scope for your imagination.

The drawings which you create can be saved individually to disk, or as sub-parts which may then be linked to existing designs at a later date. All drawings can likewise be saved to the Koala Printer by an independent icon, thus leaving you with plenty of scope to use the full facilities of this software. The *3D Graphics Board* however, is excellent in every way as a stand alone program.

Try Your Hand

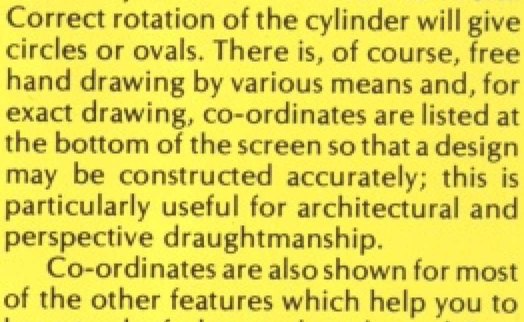
How does it work? On loading and running, a very well designed 3D Main Menu is displayed with 25 options available. Let us assume that you choose a cylinder from these options using any number of sides from three to 50. A press of the FB (or space bar) leads to the Secondary Menu with 12 options. Choose the pencil mode to draw, select three points as instructed and, in a matter of seconds there is your cylinder.

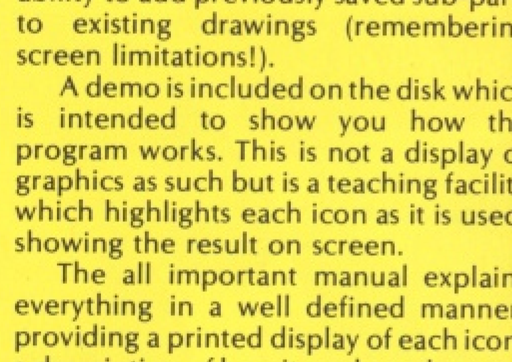
Now you may rotate, move, enlarge, reduce, twist, turn, stretch, extend, rescale, copy, change viewing angle and much more. A veritable arsenal of commands is there for your use and everything moves very smoothly and with commendable speed. Whatever you choose to do is visible on the screen as you manipulate the commands. When you are happy with the result, press the FB or equivalent space bar and your drawing is complete. You may, of course add further designs to the existing one.

Basically you have a cube, a pyramid and a cylinder with which to work. Correct rotation of the cylinder will give circles or ovals. There is, of course, free hand drawing by various means and, for exact drawing, co-ordinates are listed at the bottom of the screen so that a design may be constructed accurately; this is particularly useful for architectural and perspective draughtmanship.

Co-ordinates are also shown for most of the other features which help you to keep track of what you have been doing.

Erasure facilities are, of course, available – for total erasure, line/lines erasure and sub-part erasure. Files may likewise be erased.





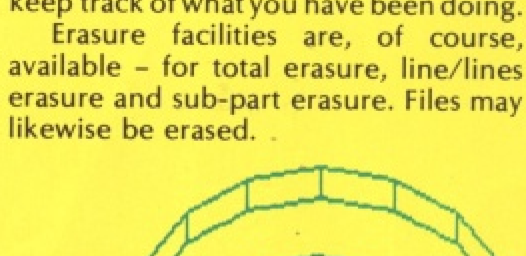
Both the Main Menu and the Secondary Menu are freely interchangeable and the permutations and combinations of such interchanges are virtually infinite. This is extended even more by the ability to add previously saved sub-parts to existing drawings (remembering screen limitations!).

A demo is included on the disk which is intended to show you how the program works. This is not a display of, graphics as such but is a teaching facility which highlights each icon as it is used, showing the result on screen.

The all important manual explains everything in a well defined manner, providing a printed display of each icon, a description of how it works and several programs you try. There are certainly no problems here and, on the final page, there is a display of the Main Menu in 'Basic English' which is a great help for quick reference.

The printer output is for the MPS801 or 802 and can be in normal or enlarged size.

Having enthused so much there remains little to say except that this is a very welcome and innovative addition to the world of 3D computer graphics on the C64/128.



Touch Line
3D Graphics Drawing Board
Glentop Publishers
£14.95

COMMODORE CLINIC

This month we introduce a new regular. Eric Doyle sorts out the most common technical problems which confuse many Commodore owners.

SLIPPING A CASSETTE INTO A recorder and saving a program is easy. Buy a disk drive and you move into a totally new environment. Tracks, sectors, drive numbers and device numbers are just a few of the new terms which have to be coped with and mastered. The manual tries to be concise but usually succeeds in being confusing. The next few paragraphs will not turn you into an expert but it should help you to get acquainted with the essentials.

To dispel the drive number confusion, let me explain. Many years ago when home computers were just a glimmer in Sir Clive's eyes, Commodore was a major force in the business world and the PET machines used single and twin disk units. A twin or dual disk drive had to be able to differentiate between its two drive units, so one was christened drive 0 and the other was named drive 1. When the goold old Vic 20 came along the new Vic 1540 drives were single units, all numbered drive 0. The DOS (Disk Operating System) stored inside the machine was based on the older dual drive system (only Commodore knows why) so a drive number will still have to be allocated even though this was always 0.

The new drives shared the serial DIN socket with printers and other peripherals. So that the computer knew which of these devices it was talking to, each peripheral was given a device number. This is rather like a phone number on an international dialling system. It's not enough just to call up the correct number, you must also speak the correct language for the peripheral on the other end to understand what you want.

Most books also take great pains to explain about tracks and sectors. For the majority of users this is not essential knowledge, all you need to know is that disk drives store information in a specific, fixed format.

A 5.25 inch disk could be used on one of a range of disk drives and each manufacturer uses a different storage format. To tell the disk that it is now to behave as a Commodore disk it has to be formatted. The action of formatting also allows you to give the disk a name of your own choosing. The older Commodore 64 and Vic 20 do not have any disk commands but, since the launch of the C-16 and Plus/4, this area has become part of the standard set of commands. Format commands look like this:

Vic 20/C64

PRINT # 15,"NØ:diskname,id"
or
PRINT # 15,"N:diskname,id"

C-16/PLUS/4

HEADER"diskname",DØ,Iid,ON U8
or
HEADER"diskname",DØ,Iid

C128

HEADER"diskname",Iid,DØ,ON U8
or
HEADER"diskname",Iid

Before using the Vic 20/C64 commands you must first open a file with OPEN15,8,15. Where the first 15 is just a file number and could have any value from one to 255, the eight is the disk's device number and the last 15 is the number which tells the computer to go into command mode.

This form of command would work equally well with any of the other three machines but in all cases the whole operation must be ended with CLOSE 15 after the formatting command has been despatched.

The diskname can be any name you fancy as long as two rules are followed. Firstly, the name must be no more than 16 characters long and, secondly, you must avoid using certain characters. A good practice is only to use letters of the alphabet or numbers for file names.

The 'id' (identifier) is the disk's real name and, as in the case of the diskname, the two characters of the id must be alphanumeric. It doesn't matter if two disks have the same diskname but all ids should be different. This cannot be ensured because commercial disks already have an unchangeable id which

could match one of your disks id's. Nine times out of ten this wouldn't matter but if a disk in the disk drive is swapped for another disk with the same id, the drive will not realise that a change has been made and chaos will inevitably follow.

When a disk is placed in the drive, the drive will read a map from the disk only if the new disk has a different id to the last disk used. This BAM (Block Allocation Map) tells the drive which parts of the disk have been used to store program information and which parts are free. If the disk has the same id as the last one used, the drive will not realise that a change has been made and will start writing to the new disk according to the BAM of the previous disk. This means that precious information on the neew disk would be destroyed because the drive doesn't know it is there.

The drive number is always zero and can be omitted on most machines as shown. The ROM chip is based on the old dual drive system and still reserves space inside the drive for the drive 1 BAM. When you become proficient with disk drive programming this could be worth noting to free internal disk memory for other purposes.

Other commands follow similar syntactical conventions.

If you must use two disks with the same id, an initialise command before accessing the information on the disk forces the drive to read the BAM on the disk. This command should not be confused with formatting, initialise merely reads from an already formatted disk.

Vic 20/C64/C-16/PLUS/4

```
PRINT# 15,"I0"
PRINT# 15,"I"
```

C128

```
DCLEAR DO ON U8
```

```
DCLEAR
```

Some of the commands available are for dual drives and can be ignored because they either don't work with a single drive or perform no really useful function. These commands are COPY, BACKUP and DUPLICATE.

With the V2.0 Basic on the Vic and C64 you cannot list the directory to the screen alone. It must be loaded as a program (with LOAD"$",8) thus erasing any program in memory. The situation is happier with the other machines using DIRECTORY to list the disk contents on the screen. On the C128 you can also use the world CATALOG.

Sometimes after an unsuccessful save attempt a directory entry will be followed by an asterisk and the block count will be 0. This is known colloquially as a 'splat file'. The block count shows how much space the program occupies on the disk. As a rough guide divide this number by four to get an approximation of the length of the program in kilobytes. A zero block count shows that something has gone terribly wrong. Before attempting to save again, the disk should be tidied up.

Vic 20/64

```
PRINT# 15,"V0"
```

C-16/PLUS/4/C128

```
COLLECT
```

This frees any disk space which may be locked up by splat files or unallocated blocks left around by deletions.

There comes a time when program files must be removed from the disk. There are two official ways to do this but only one of them is trustworthy.

The worst way to erase, or scratch, a file is using the save and replace command. Popular rumour has it that if the number of stored files is a multiple of 16 the internal file pointers can get screwed up. No one really knows for sure what happens and so it is best never to use this command.

It is better to erase the original program with the normal SCRATCH command before saving the modified version under the old filename.

Vic 20/C64

```
PRINT# 15,"S0:progname"
```

C-16/PLUS/4/C128

```
SCRATCH"progname"
```

Changing the name of a stored program can be achieved with the following commands:

Vic 20/C64

```
PRINT # 15,"RØ:new progname=old progname"
```

C-16/PLUS/4/C128

```
RENAME "old progname" TO "new progname"
```

To load a program using the asterisk, you can use one of two forms. When a load instruction takes the form LOAD"*",8,1 the last program accessed on the disk will be loaded into memory. The '1' tells the computer that this program does not go to the usual place where Basic is stored but that it should relocate it to the chunk of memory where it was originally positioned from.

If the syntax LOAD":*,8,1 is used then the first program on the disk will load no matter which program was last accessed. The earlier form, without the colon, behaves in the same way as this if the disk has just been initialised using the PRINT # 15,"I" command.

Disks are not quite as sensitive as the warnings may indicate but should always be treated with respect. Certainly physical contact with the disk surface should be avoided as should strong magnetic fields.

Often it is tempting to cut a square slot on the opposite edge of the disk to the write protect/enable slot so that both sides of the disk can be used. Two warnings should be issued with this practice. Firstly, the disks are single-sided disks. Many single sided disks start life as dual sided disks which have failed their quality test on one side only. Trying to use the second side opens up these potential problems.

The second consideration is the design of the drive. As the head reads or writes on one side of the disk, the other side spins on a felt support pad. If a tiny bit of grit settles on this pad the surface of the disk will be damaged. On a single sided disk this would not matter too much but on a doubled disk it could prove catastrophic.

I double my disks and I've rarely had problems but as you can imagine my experience of this has not been troublefree and has sometimes proved costly.

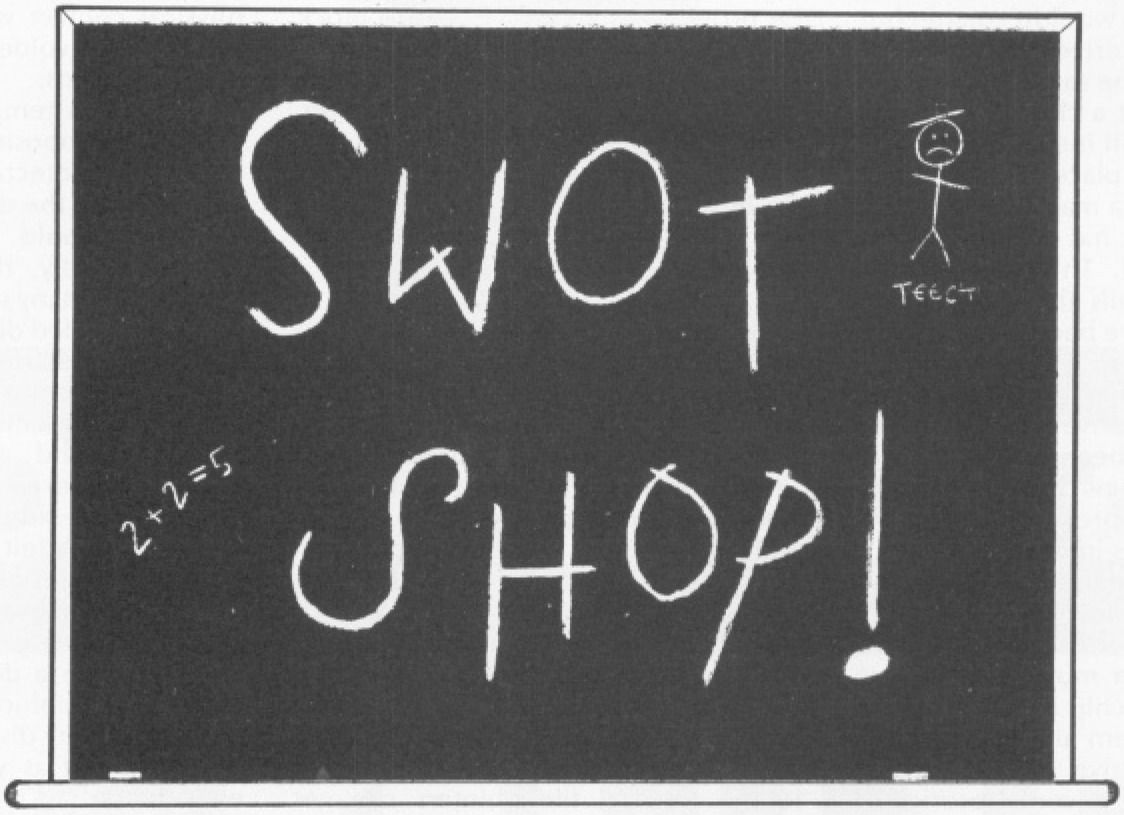
Buying a disk drive doesn't solve the problem of head alignment experienced with tape recorders. An error on a disk is usually followed by that loud chattering sound which still frightens the life out of me when I hear it. It sounds horrendous and sometimes it can knock your head out of alignment. Fast formatters are particularly guilty of doing this and head re-alignment can be expensive. As a small help you may be interested in this short utility from **Paul Barham** of Darwen, Lancashire.

```
10 INPUT "BUMPS (Y/N)" ;B$
20 IF B$<>"Y" THEN E=E+128
30 INPUT "HALF TRACK SEEKS?
   (Y/N)";S$
40 IF S$ <> "Y" THEN E=E+64
50 INPUT "NUMBER OF LOADING
   ATTEMPTS";A
60 IF A < 0 THEN 100
70 IF A > 31 THEN A=31
80 E=E+A
90 REM *** TELL THE DISK DRIVE ***
100 OPEN 15,8,15
110 PRINT # 15,"M-W"CHR$(106)CHR$
   (0)CHR$(1)CHR$(E)
120 CLOSE 15:END
```

Half track seeking means that the head searches the disk a half track on either side of the normal alignment. This has enabled me to read a disk which was created when my drive was slightly out of kilter. I hope it helps you one day.

By The Way

The Commodore Clinic is to become one of our regular features. It's the *Your Commodore* casualty unit where you can send your problems and we'll sort them out as best we can. Get your letters written as our technical boys are raring to go.



Margaret Webb with ideas on how to fill those long, hot, summer, days.

HOPEFULLY THIS SUMMER WON'T BE as wet or cold as last year however in the unhappy event of it being an action replay, I've been looking at ways of helping to alleviate the boredom that a combination of weather and school holidays can create.

Of course not all the products looked at here are marketed as educational but then again we are looking at the summer break period and it doesn't seem quite fair to insist on non-stop learning. in any case a lot of the programs have a fair amount of subliminal education.

OK let's get down to some ideas.

Tongue Tied

Learn a language (or brush up on one you know).

If you want to use a couple of days practising your French verbs before flying off to the Cote d'Azure try *La Conjugaison* from Edstat. This is a disk and instruction booklet pack which sets out to help you improve your use of verbs. It does this by the time tested method of game playing. There are four games to play, each testing a different combination of tenses. In each game you select the verbs you want from a comprehensive list and then decide on the tense or tenses you wish to use. After that you play a game and try to beat the computer.

In the first game "Sky Burst", you have to burst the balloons that do not match the red one. The aim being to test your knowledge of verb endings. In "Train Spotting" you have to spot and record the tense. The signal lights let you know how you're doing.

"Air Display" and "Walled In" test your knowledge by asking you to put your chosen verb in the same tense as the computer's in one game and build a wall of knowledge in the other.

A final game called "Masterplay" tests you on all you have learnt in the previous games. Quite a good package and well worth a look at.

For the absolute beginner or anyone wanting to reinforce what they know, Audiogenic offers a *Linkword* system. These programs use the premise that certain ideas or memory joggers help the retention of something learnt. Learning noun genders, for example, can be a chore but the linkword way is to picture the word you are learning in a fun way. The French for dog is 'le chien' (masculine) and it can help if you remember the image of a boxer getting into a boxing ring. This links the ideas of male boxer to boxer dog. Conversely, cat is feminine in French and it may help to visualise a beautiful Persian cat sat on the Shah of Iran's knee. This is a double jogger since the French for cat (La chat) sounds similar to shah and the Persian cat is a feminine image.

The linkword system is available on both the 64 and the Vic plus 8K memory and covers a range of languages. Overall, the system works well.

Star Quality

Become a Hollywood or Ealing (not Broadway) mogul.

If you don't feel like serious activities, how about something creative? There are several graphics systems on the market but apart from creating static pictures there isn't much else you can do with them. Ariolasoft has extended the "construction kit" concept to include animation – The Movie construction set. This package uses the well tried concept that if you look at a sequence of slightly different pictures, you will see movement.

The package opts for the use of multicolour high resolution graphics rather than sprites, thus allowing full screen animation. The package is laid out in a manner similar to the structure of a film studio. There is an art department, a camera man, a sound man and a director. Each is used to build up the final sequence. The really bad news about the package is that the manual is written by Americans, presumably for Americans. This means a rather involved and not particularly readable time.

The programming is of a high standard and is versatile. In essence, you create your drawings, lay down sequences of movement over several tracks (allowing parallel movement), add the music and smooth the animation. Overall, a nice product which is limited only by the child's imagination and creativity.

Music Maestro

So you don't want to be a Spielberg? How about a Mozart?

There are quite a number of music systems around (I described several in

Your Commodore Christmas '85). Probably the best around at the moment is the *Music System* from Rainbird. This comes in two versions: the beginners system and the advanced system. Most of you will find the beginners system quite sufficient for the creation of music.

The system has two segments: a music editor and a synthesiser. The music editor allows you to write a three part piece of music. You can either enter it by playing the tune. The plastic "Sight and Sound" keyboard overlay works with the system and you lay down the tracks in the same way that you use a tape recorder. Facilities are provided to allow you to smooth out the timing of your masterpiece and limit the note length depending on your ability.

Alternatively, you can enter notes direct from written music. All the standard notation is supported and you can transpose your piece at will. This, in itself, is a powerful education aid in that you can instantly link a sequence of written notes to its sound. Handy if you can't play from sight.

Once you've written your music, you can modify and create sounds using the synthesiser. An additional software feature called the Dynamic Response Envelopes allows you to create the most bizarre squeaks, burbles and other noises.

This isn't the cheapest package but it's excellently designed and is a joy to use.

Light Relief

To many people the computer is simply a games machine and it is true that there is a multitude of "kill the nasty" type games. Despite my earlier comments, it is difficult to see how killing an alien will educate you. However, there is a category of game which can tach you a great deal – the adventure.

In the early days, adventures were simple affairs in which you went around picking up treasures and killing nasties – not very educational. There is now, however, a new breed of adventure in which you can interact with the scenario – Infocom calls it "interactive fiction". Such games encourage the use of logic, lateral thought and problem solving. The examples are legion but the companies worth noting are Infocom, Telarium and Activision.

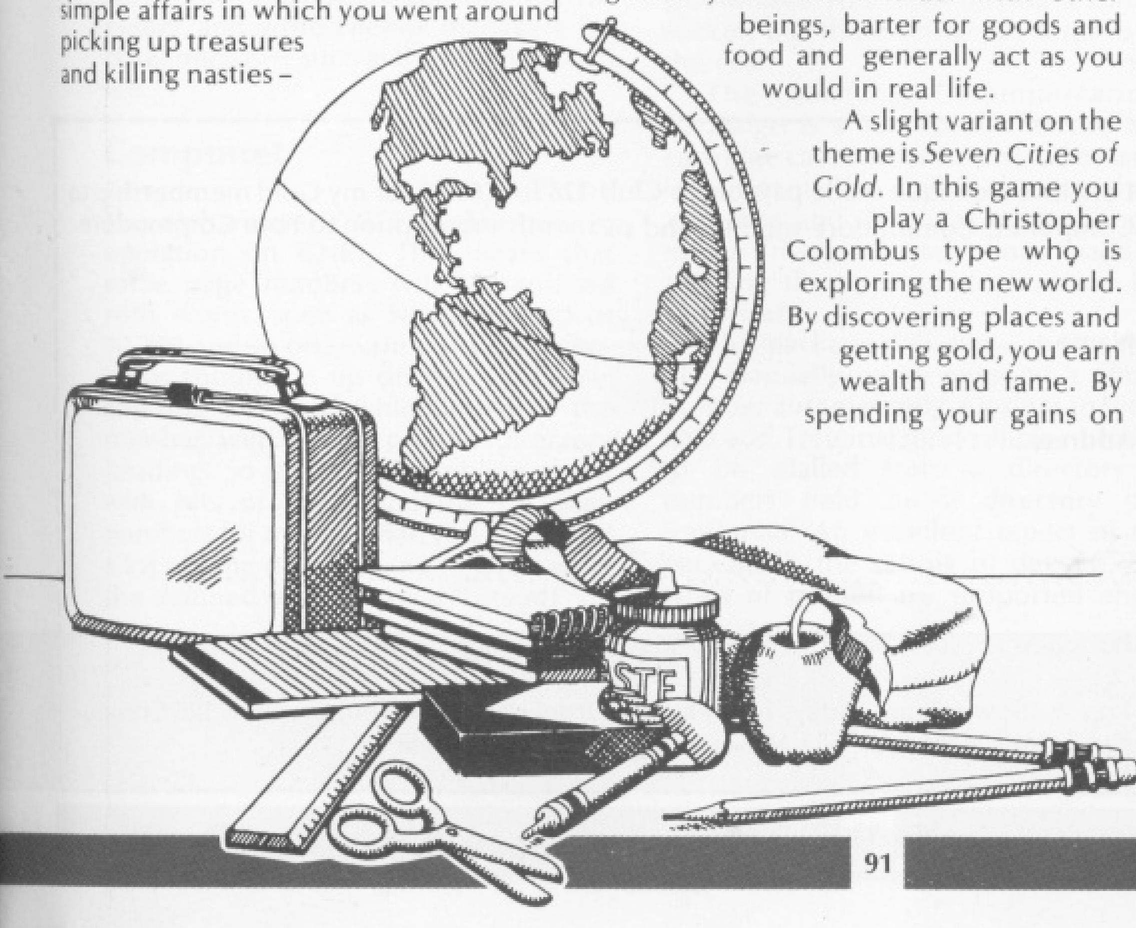
Infocom specialises in text only games based on disks. The plots are complex, amusing and difficult to unravel. The range of game is wide covering the surreal (*Hitch Hiker's Guide to the Galaxy*), science fiction (*Suspended* and *Starcross*), fantasy (the *Zork Trilogy*, Spellbinder) and crime (*Deadline*). I recommend these games without reservation.

Telarium offers text/graphics games generally based on well known fictional works. Earlier games include Farhenheit 451, *Rendezvous with Rama* and *Amazon*. The two most recent games are *Nin Princes in Amber* and a *Perry Mason* game. Having read the book, I found that *Nine Princes in Amber* follows the original work closely. There is a variety of possible endings which depend on decisions made during play. The plot is perhaps less complex than Infocom's but with excellent graphics, it is highly playable. There are additional elements including combat which add to the usual adventure concepts.

Activision is a relative newcomer to adventures but nevertheless is producing polished and high quality games.

There is an increasing interest in role playing games, rather along the lines of Dungeons and Dragons. These tend to be rather more biased to graphics but the skills required are different. These games are generally real time with the need for instant decisions and the control and distribution of resources.

Alternate Reality and *Ultima II* are two excellent examples. These use good graphics to portray your travels. In these games you must interact with other beings, barter for goods and food and generally act as you would in real life.



A slight variant on the theme is *Seven Cities of Gold*. In this game you play a Christopher Colombus type who is exploring the new world. By discovering places and getting gold, you earn wealth and fame. By spending your gains on new ships, men, provisions and goods, you can explore further and achieve more. The graphics are again excellent and this is a challenging game which needs care and thought.

Due to the data requirements, all of these games are disk based although Activision has converted some games to cassette.

Do it Yourself

If you don't want to play but do seek mental stimulus, how about writing your own game?

There are a number of game creation packages around. If adventures are your thing, *The Quill* is a well known system. This allows you to create your own adventure database for your personal use or sale. This can be enhanced by a picture drawing add-on.

If you would rather create a graphical adventure, Ariolasoft's *Adventure Construction Kit* is a possibility. This allows you to design your own graphics and layout and then lay down the rules for play. The system is most suited to Dungeon and Dragon scenarios although others are possible.

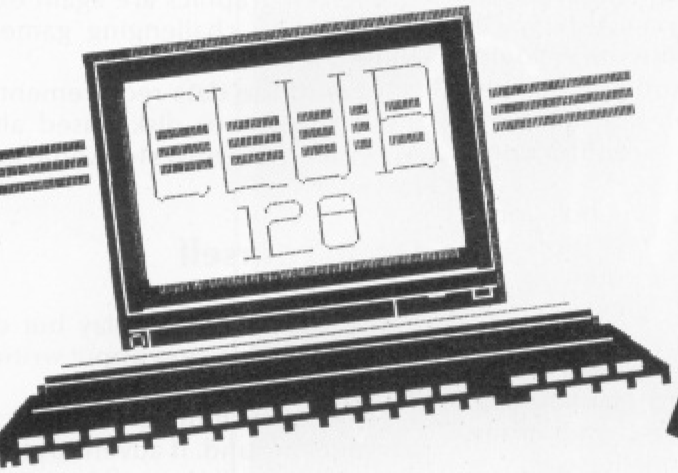
If arcade games are for you, two packages are worth a look.

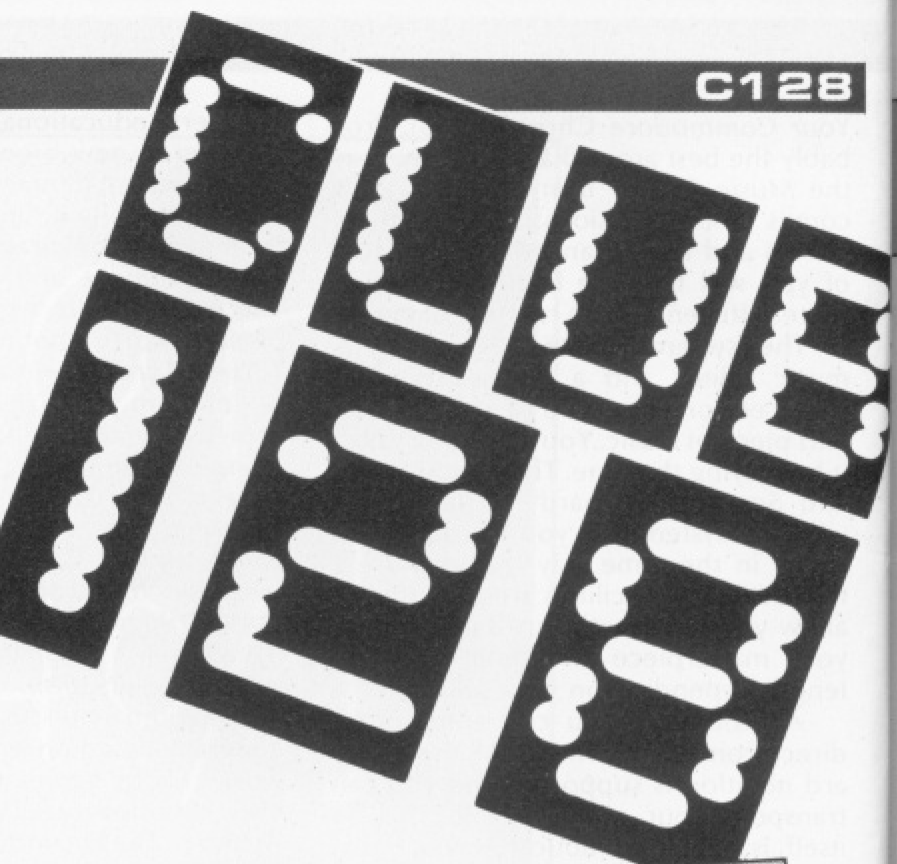
Activision offers *Gamemaker*. This combines backdrop, sprite, sound and music editors which can then be incorporated in the game logic. A simple programming language is provided to allow animation, movement and the specification of collision and movement rules. Very slick albeit a little pricey. If your wallet doesn't run to this package, Mirrorsoft offers a cheaper and simpler *Games Creator*. It is less flexible but works pretty well.

Most of these pieces of sotfware can easily be purchased at your local shop so why not give them a look. The list is really aimed as a guide rather than intended to be exhaustive. The idea was to make suggestions as to the sort of activities which can be tried by one or more children to pass time and have fun but they also include a touch of learning.

Touch Line

Rainbird Music System: £17.95
Activision: Mindshadow £9.95 (cassette) Tractor Sanction £9.95 (cassette), Gamemaker £14.99 (cassette), £19.99 (disk)
Telarium: Nine Princes in Amber £19.95 (disk), Perry Mason – The case of the Mandarin Murder £19.95 (disk)
Infocom: Spellbinder £19.95 (disk), Starcross £11.99 (disk), Deadline £11.99 (disk), Zork Trilogy £11.99 (disk), Hitch Hikers Guide to the Galaxy £24.75 (disk)
Ariolasoft: Adventure Construction Kit £14.95 (disk), Moviemaker £16.95 (disk), Seven Cities of Gold £14.95 (disk)
US Gold: Alternate Reality £14.94 (disk).





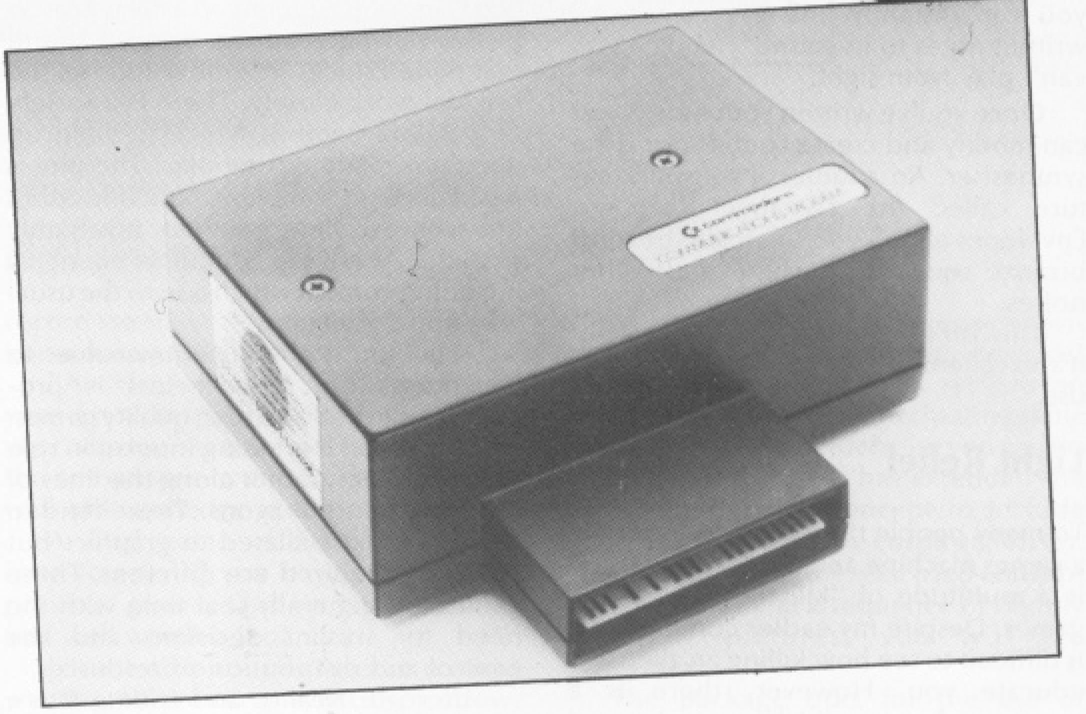
HAVE YOU EVER WANTED TO GET INTO communications? Would you like to get in touch with other Commodore owners? Well, Your Commodore, together with Compunet, are pleased to announce the start of Club 128, and give you a chance of a special membership offer.

Club 128 will appear on Compunet as a 'free access' area open to all CNET subscribers.

The club will be the focal point for all 'serious' users of Commodore computers, hence the '128' affiliation. The 128 doesn't mean that owners of C64s can't join. In fact the club is open to all Compunet members though only 'serious' users are expected to make a great deal of use of it.

Many sections of Compunet are due to be 'pulled in' to this online area, including the 'Briefcase' business section that is already in existence.

Your Commodore will have a magazine section within the club area where you will be able to find news and the latest programs that are published in the Magazine.



The Offer

So what do you get and what does it cost?

Your Commodore is offering a special membership to the Club for £69.99 (inc VAT and P&P in the UK) including:

A Commodore 64/C128 Communications modem (worth £79.99)

A three month GOLD subscription to Compunet (worth £15.00)

A six month subscription to Your Commodore

*** PLUS ***

£10.00 of discounts on selected business and communications software, including software for accessing Viewdata and Electronic Mail services such as Prestel and Telecom Gold.

In order to take advantage of this special offer you simply need to send a cheque or Postal Order made payable to Club 128 to the address on the below order form.

I enclose a cheque made payable to Club 128 for £69.99 for my Gold membership to Compunet, Commodore modem and six month subscription to Your Commodore.

Name ....

Address ....

....

....

Postcode ....

Please allow at least 28 days for delivery. Order should be sent to: Club 128 Compunet Teleservices Ltd, 7-11 Minerva Rd, London NW10 6HJ.

COMMUNICATION

David Janda keeps you in touch.

AT THE TIME OF WRITING THE COMmodore show has just ended. It was good to see many faces behind the ID's and have a good old natter! The show itself (comms wise) was VERY interesting, so without any further delay — on with the news!

Micronet

First TurboChat. This service should be well under way by the time you read this. I have covered the facilities it offers before, but to recap it will be a fast chat facility where the screen is split into four parts. New messages will be highlighted as they appear in each of the portions and there will be a facility to scroll back though an archive of 100 messages. The news is the price. TurboChat will cost a penny per message sent — no time charge. There will be no cost incurred looking at the current or previous messages. Now at a measly penny to send a message, TurboChat will knock the spots off Compunet's Partyline as far as value for money is concerned!

Several months ago Filebox, the method of transferring files between users on Prestel, was in the news. This facility is only available for BBC micro users at present because the Filebox manager software has only been written for said micro. With the event of Vascom I hope that Prestel and/or some third party software houses get their act together and write Filebox managers for other micros — such as the C64! We shall see.

Compunet

The alphanumeric GOTOs are now in operation on CNET. This means that some page numbers will be replaced with words, such as NEWS instead of 107701 and so on. A directory of Alphagotos should be up on CNET by now, and the keyword which replaces the number will appear on the directory heading. So instead of fumbling about with bits of paper looking up page numbers for this and that, you can spend a lot of time online trying to guess what the damned page is called instead!

Review!

Yup. Here is the first review in Communication Corner. I have promised a review of the *Voyager 7* modem from Modem House for some months now. Alas, delays in getting BABT approval and the lack of appropriate software for the device has prevented me from reviewing the modem previously. Anyway, here are my first impressions of the *Voyager 7 V21/V23* modem from Modem House as used with *Mustang 64 Communications Cartridge V2.0* from Y2 Computing. Unfortunately the lack of software and manuals for the modem means that I cannot supply the full spec, but planet brain has managed to pull through!

The *Voyager 7* is a V21/V23 device which is suitable for use with Viewdata and scrolling types of DB. The baud rates available are 300/300, 1200/75, 75/1200, and 1200 half-duplex. A test mode allows the modem to be tested offline at 300 baud. The *Voyager 7* offers auto-dial and auto-answer as standard and Bell frequencies are available on export models only.

The modem is of 'average' size; 165×145×55mm. Four rubber feet keep the kit firmly on the table or whatever, and an ample length of mains and PTSN cable is provided. A five-pin domino type (female) socket at the back is used to connect the *Voyager* to the Comms Cartridge, and a six-way rotary switch on the front panel is used for selecting the baud rate (originate or answer) or test mode. Five coloured LEDs on the front indicate data flow, power, carrier detect and so on. In all the design is fine. I would have liked to have seen an inline socket at the back of the modem which would save you from buying a splitter socket, but these things do tend to up the cost.

The *Mustang Communications Cartridge* is a 16K Eprom housed in a cartridge case with modem lead extending from it. The package incorporates Viewdata and Terminal modes, and is menu driven with selections made by pressing the appropriate function key (surprise?).

The package will allow the user to dial manually or by entering a phone number automatically. Options in Viewdata and Terminal mode allow numbers to be dialled from a directory of numbers held on a directory disk (optional). An excellent aspect of this package is the setting of devices. Ten types of printer are supported and a Centronics driver is included. Device numbers can be allocated and the package can load/save data to and from disk or tape.

In Viewdata mode a mailbox can be prepared offline and this facility can also be used to enter your user ID and password.

The terminal mode is a little mroe complex offering options for 1200/75 dial, 75/1200 answer, as well as 300/300 dial/answer. Another option from the terminal menu enables characteristics — such as line feeds, start and stop bits — to be defined and so on.

In Use

Setting up the *Voyager* and *Mustang Cartridge* was no problem whatsoever. Even though I didn't have a manual handy, it only took a few minutes to get the hang of the software. A nice feature about the Viewdata mode is that a realtime clock displays the amount of time logged on. Pressing F1 whilst online, would return you to a help menu with options for downloading, re-displaying a page and such like. The more experienced user can access all these features whilst online by simply pressing the appropriate function key.

The terminal mode was a bit disappointing in use. Lots of online information such as file status, time XON status are displayed and a comprehensive help menu is also available. The two features missing from this package are 1200/1200 baud half-duplex support and the popular XMODEM file transfer protocol.

When used together the *Voyager 7* and the *Mustang Cartridge* complemented each other. The only niggle I have is that the Terminal mode of the *Mustang Cartridge* would very occasionally drop the line before the service even answered the phone! Other than that the modem and software make an excellent combination and I wouldn't hesitate in recommending them.

Logoff

Next month a look at some scrolling software, bulletin board software, another modem and a VERY special offer from Micronet! Until next time!

David Janda can be contacted on one of the following services; Prestel **919992677**, Compunet **ID D. JANDA**, One-To-One **13419001** and Telecom Gold **72: MAG95307**.

CORNER

WELCOME TO THE MACHINE

Allen Webb shows you how to speak fluently to your computer.

ONE OF THE ESSENTIAL pieces of equipment for a machine code programmer is an assembler. I have recently managed to get hold of a copy of Laser Genius from Oasis/Ocean and I've had a good play around with it. My reaction is that, at the price (about £15 on cassette and £20 on disk), it's a real gem!

The assembler/editor is essentially the same as that in Machine Lightning so there's no real surprises from that quarter. Unlike most other assemblers, this package uses its own operating system rather than the 64's editor. This not only means a lot of extra toil for the author but you get a large range of additional commands and toolkit aids. I found this a little inhibiting since a crash when testing your own programs means that you must reload the system. With assemblers which use the 64's editor, a quick stab of the reset button followed by an OLD command generally saves the day.

The gem of the system is the new monitor/analyser. I wasn't too happy about the monitor with Machine Lightning and this new addition is a great improvement.

On its simplest level, you can use the monitor to set simple break points and single step through the program. This allows you to keep an eye on how the registers change and hopefully locate errors. If you have a complex program or have an intractable error, the analyser may help. The analyser uses a subset of FORTH to allow you to specify a break point. You could, for example, cause your program to stop the very instant that a specified location is read. To the more experienced machine code user, this ability would be very handy.

I don't really have space here to fully review this product, no doubt someone else at *Your Commodore* will do this. I will simply say that, in my opinion, at the price, this package is probably the best around at the moment.

I mentioned a thing called a break point. When the 6510 encounters a zero byte, it performs a jump to the address held in locations $0316 and $0317. This normally performs a warm reset returning you to a blank screen with READY at the top. Machine code monitors change these addresses to that when a zero byte is executed, the monitor is entered. This allows you to examine the registers and sort out what's happening. The instruction BRK inserts a zero byte to allow breaks.

The use of BRK is handy if you're worried about a crash and want the program to stop at a specific point.

Some of the most frequently used features of the 64 are the interrupts. There are three available:

1) The interrupt request (IRQ)
2) The non-maskable interrupt (NMI)
3) Raster interrupts.

The IRQ operates 50 times a second. It scans the keyboard and handles the clock. Every 50th of a second, the processor stops what it's doing and jumps to the address held in locations $0314 and $0315 ($EA31). This performs the necessary functions before returning to normal processing. It is a simple matter to wedge extra code into the IRQ. Consider listing 1:

Listing 1

```
10  ASSEMBLE 90,I
90  REM *=$C000
100 REM SEI
110 REM LDA £<MAIN
120 REM STA $0314
130 REM LDA £>MAIN
140 REM STA $0315
150 REM CLI
160 REM RTS
170 REM .MAIN: INC 900
180 REM LDA 900
190 REM CMP £50
200 REM BNE OUT
210 REM LDA £0
220 REM STA 900
230 REM INC $D020
240 REM LDA $D020
250 REM AND £15
260 REM STA $D020
270 REM SEC
280 REM LDA £15
290 REM SBC $D020
300 REM STA $D021
310 REM .OUT: JMP $EA31
320 REM ]
```

Lines 100 to 160 put the start address of the new code into the IRQ jump address. This introduces two new instructions:

SEI: this disables the interrupt by setting the interrupt flag. This prevents the execution of the IRQ before we've changed the jump address.

CLI: this restores the interrupts once the wedge is complete.

The main routine is designed to change the screen and border roughly once a second. Location 900 is a counter. This is incremented every time the routine is called and the colours are changed every time it reaches 50. Since the routine is called 50 times a second, this should happen once a second. Geddit? Line 310 is vital since once the routine is finished, we must finish the normal IRQ action. If you run the routine, you will see that the 64 will run as normal except that the screen will change colours continuously. Basic programs will run as normal albeit slightly more slowly.

Raster interrupts work in conjunction with the IRQ and perform action depending on the position of the screen scan. Listing 2 shows how to get split screen effects.

Listing 2

```
10  *=$C000
20  R1=83130
30  R2=832
40  ME=833
50  LN=834
90  SCOL=829
100 BCOL=830
110 INIT SEI
120 LDA £$7F
130 STA $DC0D
140 LDA £$01
150 STA $D01A
160 LDA NOZONES
170 STA COUNT
180 LDA HEIGHT
190 STA $D012
200 LDA £$18
210 STA $D011
260 LDA £<MAIN
270 STA $0314
280 LDA £>MAIN
290 STA $0315
300 CLI
330 RTS
340 MAIN LDA $D019
350 STA $D019
360 AND £$01
370 BEQ LOOP1
380 DEC COUNT
390 BPL LOOP2
400 LDA NOZONES
410 STA COUNT
420 DEC COUNT
430 LOOP2 LDX COUNT
440 LDA BORCOL,X
450 STA $D020
460 LDA SCNCOL,X
470 STA $D021
480 LDA REG1,X
490 STA $D011
500 LDA REG2,X
510 STA $D016
520 LDA MEM,X
530 STA $D018
540 LDA HEIGHT,X
550 STA $D012
560 TXA
570 BEQ LOOP3
580 LOOP1 PLA
590 TAY
600 PLA
610 TAX
620 PLA
630 RTI
640 LOOP3 JMP $EA31
650 HEIGHT BYT 1,129
660 SCNCOL BYT 5,13
670 BORCOL BYT 5,13
680 REG1 BYT 27,27
690 REG2 BYT 8,8
700 MEM BYT 20,22
710 NOZONES BYT 2
720 COUNT BYT 0
```

Lines 110 to 330 set up the raster routine. This is similar to the simple IRQ routine except that the raster check must be set up. Lines 120 to 150 turn on the IRQ raster. Lines 180 to 210 set the initial value into the raster compare. Lines 340 to 350 check to see if the raster scan has reached the required position. If not it branches to LOOP1 and exits via the RTI (RTI clears the

interrupt flag, restores the status register and performs an RTS). If the scan is at the switch point, the new set of Vic register values are set up and the new switch point put into the raster compare (line 550). If the last zone has been handled, the routine exits via the normal IRQ address (LOOP3).

Line 650 onwards hold tables of the Vic register values, REG1 and REG2 specify the graphics mode and line 700 determines the character type. As set up, the routine makes the top 10 lines of the screen pale green with lower case characters and the bottom 15 lines dark green with upper case characters.

Sorry if my commentary on this routine is brief but space doesn't allow a fuller description. If you study the routine you should be able to sort it out.

I want to start discussing one of the most valuable funds of routines available, the ROMs. By using many of the on-board routines, you can save a lot of time and grief. First, we have the Kernal ROM. Most of the routines are accessed from a jump table (to allow upward compatibility between machines) near the top of memory.

Some of the most useful follow.

Plot

This routine, depending on the carry flag, either sets or reads the cursor position. The X register is used to hold the row and the Y register to hold the column of the cursor. If the carry is set, the routine returns the current cursor position in these registers. If the carry is cleared, the cursor is set according to the registers. Listing 3 shows a simple demo.

Listing 3 ($FFF0)

```
10  ASSEMBLE 100,I
100 REM *=$C000
110 REM LDY 900
120 REM LDX 901
130 REM CLC
140 REM JSR $FFF0
150 REM RTS
160 REM ]
170 FOR A=0T03,5STEP,1
180 POKE900,X:POKE901,SIN
    (A*5 )*10+12:SYS12*
4096:PRIT"*":X=X+1:
    NEXT
```

CHRIN ($FFCF)

This routine reads a byte from the current input channel. Unless you open a different channel, it flashes a cursor and awaits an input. Listing 4 awaits an input and when RETURN is pressed, it puts the text input into a buffer – in this case the top of the screen. The routine functions correctly but for some reason the text is moved to the buffer only after RETURN is pressed. Can anybody tell me why? (I can't sort it!)

Listing 5

```
10  ASSEMBLE 100,I
100 REM *=$C000
110 REM LDY £0
120 REM .LOOP:JSR $FFCF
130 REM CMP £13
140 REM BEQ DONE
150 REM STA $0400,Y
160 REM INY
180 REM JMP LOOP
190 REM .DONE: RTS
200 REM ]
```

GETIN ($FFE4)

This routine reads a byte from the input channel and returns it in the accumulator. If no byte was read, a zero byte is returned.

CHROUT ($FFD2)

We've met this one before. It prints the character currently in the accumulator and is equivalent to PRINT CHR$(X).

Listing 6 shows the use of GETIN and CHROUT in the same routine to give a typewriter. Line 130 checks for RUN/STOP (CHR$(3)).

Listing 6

```
10  ASSEMBLE 100,I 100 REM
*=$C000
110 REM .LOOP: JSR $FFE4
120 REM BEQ LOOP
130 REM CMP £3
140 REM BEQ OUT
150 REM JSR $FFD2
160 REM JMP LOOP
170 REM .OUT: RTS
180 REM ]
```

Homework

We've got a lot to cover this month, so let's get last month's homework out of the way quickly.

Question 1 is a commonly encountered situation and is easily solved. Here is one solution:

Listing 7

```
10  ASSEMBLE 90,I
90  REM *=$C000
100 REM .LOC=900
110 REM .X=902
120 REM .Y=903
130 REM LDA £0
140 REM STA LOC
150 REM LDA £4
160 REM STA LOC+1
170 REM .LOOP2: LDA Y
175 REM CMP £1
180 REM BEQ LOOP1
190 REM CLC
200 REM LDA LOC
210 REM ADC £40
220 REM STA LOC
230 REM LDA LOC+1
240 REM ADC £0
250 REM STA LOC+1
260 REM DEC Y
270 REM JMP LOOP2
280 REM .LOOP1: CLC
290 REM CLC
300 REM LDA LOC
310 REM  ADC  X
320 REM STA LOC
330 REM LDA LOC+1
340 REM ADC £0
350 REM STA LOC+1
360 REM RTS
370 REM ]
```

The basic equation is:

$$LOC = 1024 + (Y-1) \times 40 + X$$

Where Y is in the range one to 24 and X is in the range one to 39.

The routine splits the equation into three and works on that basis. First, it puts 1024 into LOC (lines 130-160), it then adds (Y–1) × 40 and finally adds on X. You will appreciate that when Y=1, the middle portion is unnecessary. Lines 175 and 180 detect this and branch accordingly. The middle portion evaluates the multiplication by repeated additions. For example, 40 × 5 is the same as adding 40 five times. Lines 190 to 270 do this. To save space, lines 175 and 180 are used to jump out of this process. The rest is simple 16 bit arithmetic.

Questions two and three are linked. Let us consider how the high resolution screen works. The screen is split into 1000 characters squares. Each character square holds eight rows of eight dots. Each dot in any row is controlled by the relevant bit in that byte. For example, the leftmost dot is controlled by bit seven and the rightmost dot by bit zero. To set a dot, you simply set the relevant bit. This is achieved by ORing the relevant bit with a mask. Since each bit represents a power of two in binary, we OR with two raised to the power of the bit.

Question 3 asks you to do the reverse. We want to erase a specific bit. This is achieved by ANDing with a mask. Since we want to leave all the other bits untouched, the mask must comprise of all ones except for the bit to be cleared i.e. to erase bit one use %11111101, to erase bit six use %10111111. These masks are simply the ones complement of the bit value (bit value minus 255). The routine to do the job becomes:

```
LDY £0
LDX BIT
LDA ($FB),Y
AND TABLE,X
STA ($FB),Y
RTS
TABLE .BYTE 254,253,251,247,
239,223,191,127
```

The homework for this month follows my general theme of being nastier:

1) An easy one. A routine to flash line message somewhere near the bottom of the screen (e.g. "Press a key to start").

2) A routine to download the character set to start at location 12288 and turn it on. Here is a Basic program which does the job:

```
10 POKE S2,48: POKE 56,48
20 POKE 56334,PEEK(56334)
AND 254
30 POKE 1,PEEK(1) and 251
40 FOR I=0 TO 511
50 POKE 12288+I,PEEK(53248
+I)
60 NEXT
70 POKE 1,PEEK(1) OR 4
80 POKE 56334,PEEK(56334)
OR 1
90 POKE 53272,(PEEK(53272)
ND 240)+12
```

It's up to you to sort out how this works.

3) If you've got example 2 working, write a routine which rolls the design of the character specified in location 900 one pixel to the left. Don't forget that a roll moves the leftmost pixel to the rightmost position so that eight rolls should leave you with the starting design.

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